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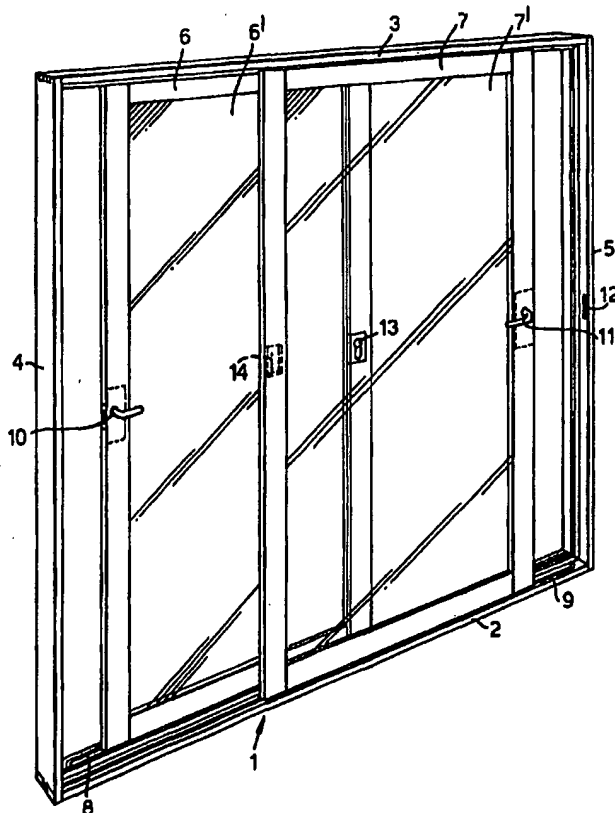
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(54) Title: SLIDING PANEL CONSTRUCTION

(57) Abstract

The invention relates to a device for supporting and guiding the movement, in both the longitudinal direction and laterally, of a sliding panel (6; 7) in a frame structure (2) by using guide tracks (8; 9) and vertically adjustable guide castors. The vertical position of the sliding panel is adjustable with the aid of a bogie-based carrying wheel mechanism (25, 25', 103-106). A locking mechanisms (10; 11) having a specially designed striking plate (12) is instrumental in locking the sliding panel, and in advancing the longitudinal and sideways movement of the sliding panel close to the locking position, optionally in interaction with an espagnolette fitting (69-73) which has chamfered bolt end portions and a specially designed striking plate. A safety fitting (28, 29) for the rear edge of the sliding plane is instrumental in obtaining an efficient seal between the frame structure and the sliding panel via a weather strip, whilst increasing security against burglary. The use of especially designed guide fittings (52; 56) having a kidney-shaped turning piece intended for engagement with the end edge of the sliding panel can replace the use of an espagnolette fitting.



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## SLIDING PANEL CONSTRUCTION

The present invention relates to a device for longitudinal movement of a sliding panel, e.g., a sliding door or sliding window, and a simultaneous lateral movement of the sliding panel in an end position where it practically closes an opening in the frame structure

Furthermore, the invention relates to a safety fitting, a locking device and a guide fitting for the sliding panel, such as a sliding door or sliding window, where the sliding panel is movable in a frame structure either relative to a fixed element constituting a part of the frame structure or relative to a second sliding panel which is movably mounted in the frame structure, and where the safety fitting has a male part adapted to engage with a female part, whilst the locking means has a lock case having a movable dead bolt, preferably provided in the frame of the sliding panel, and a striking plate, preferably provided in the frame structure.

Sliding doors and sliding windows having only sideways movement do not meet the sealing requirements that apply to doors or windows which are exposed to storms, wind and rain, especially driving rain. Nor is the sealing sufficient as regards fire or the passage of sound. Therefore, a sideways movement or depthwise movement of the sliding panel, such as a door or window, is required, whereby the weather stripping will be compressible against the frame rebate. If sealing can also be obtained at the corners of doors or windows, the sealing capacity is increased considerably. It is also important that the seal is attached equally firmly around the whole door or window.

Today, different methods are employed to provide this depthwise movement or sideways movement, such as gripping arms which close to either on sideways movement or by means of actuation by a handle in the closed position. Guiding channels which successively change the direction of movement from sideways to depthwise also exist. The invention described below belongs to the last category, but has several distinctive features and advantages which make it superior to the known structures.

The features characteristic for the invention of the said device, safety fitting, locking device and guide fitting are set forth in the patent claims below and in the description below with reference to the appended drawings.

Figure 1 shows, by way of example, a sliding panel which is movable relative to a second movable sliding panel in a frame structure.

- 5 Figure 2 shows, by way of example, a sliding panel, where this is movable in a frame structure relative to a fixed element.

Fig. 3 shows the section III-III in Fig. 2.

- 10 Fig. 4 shows the section IV-IV in Fig. 2.

Fig. 5 shows a sliding panel that is movable in a frame structure relative to a fixed element.

- 15 Fig. 6 shows the section VI-VI in Fig. 5.

Fig. 7 shows an overhead rail with guide track for use with the embodiment in Fig. 6.

Fig. 8 shows the section VIII-VIII in Fig. 5.

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Fig. 9 shows a sliding panel which is movable in a frame structure relative to a fixed element.

Fig. 10 shows the section X-X in Fig. 9.

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Fig. 11 shows the overhead rail in Fig. 10 with guide track and with guide pins or castors indicated together with suspension wheels.

Fig. 12 shows the section XII-XII in Fig. 9.

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Figs. 13, 14 and 15 show a sliding panel during movement in a longitudinal direction in the frame structure in a non-closed position, a partially closed position and a closed position, respectively.

- 35 Fig. 16 shows a lock case with an espagnolette fitting which forms a part of the locking device according to the invention.

Fig. 17 shows the lock case in interaction with a striking plate.

Fig. 18 is an elevation of the striking plate in Fig. 17.

5 Fig. 19 shows the locking device in Figs. 16 and 17 in engagement with the striking plate.

Fig. 20 illustrates adjustability of the striking plate relative to the locking device dead bolt.

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Fig. 21 is a view along the line XXI-XXI in Fig. 20.

Fig. 22 is a vertical projection of the lock case with espagnolette mechanism, otherwise as shown in Fig. 19.

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Fig. 23 shows a fitting which forms the striking plate for an espagnolette lock which is a constituent part of the locking device.

Fig. 24 shows the section XXIV-XXIV in Fig. 23.

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Fig. 25 shows the section XXV-XXV in Fig. 23.

Fig. 26 shows the section XXVI-XXVI in Fig. 23.

25 Figs. 27 - 29 show the adjustment facility of the guide castors respectively at the top and the bottom of the sliding panel, whilst Fig. 28 shows a plan view of the solution in Fig. 27 seen from above.

Fig. 30 illustrates the method of mounting the two movable sliding panels in a frame structure and Fig. 31 shows the sectional portion XXXI in Fig. 30 with the sliding panels in place.

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Figs. 32-35 illustrate the function and adjustability of a safety fitting for a sliding panel that is movable in the frame structure relative to a fixed element which is a constituent part of the frame structure.

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Fig. 36 shows a cross-section through a lower portion of a sliding panel and adjacent sill member in the frame structure.

Fig. 37 shows the section XXXVII-XXXVII in Fig. 36.

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Fig. 38 shows a turning piece for forced motion of the sliding panel transverse to the frame structure, where the sliding panel is a short distance from a vertical portion of the frame structure.

- 10 Fig. 39 shows the same as in Fig. 38, but where the sliding panel is closer to the said vertical portion of the frame structure and transverse forced motion has commenced.

Fig. 40 shows the sliding panel in contact with the vertical portion of the frame structure and the turning piece in its locking end position.

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Fig. 41 is an elevation of the turning piece as disclosed in Figs. 38-40.

Fig. 42 shows a partially cutaway vertical projection of the height-adjustable carrying wheel.

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Fig. 43 shows the carrying wheel in a bogie assembly with height adjustable supporting axle.

- Fig. 44 shows a bottom view of the embodiment in Fig. 43 as indicated by the reference  
25 XXXXIV-XXXXIV.

Fig. 45 is a view along the line XXXXV-XXXXV in Fig. 43.

- Fig. 46 is a vertical projection of a sliding panel, e.g., a sliding door in typical sliding  
30 position.

Fig. 47 shows the sliding panel adjusted to its maximum lower position, whilst Fig. 48 shows the sliding panel adjusted to maximum upper position.

- 35 Fig. 49 shows how the two sliding panels, which are capable of moving relative to one another in a frame structure, may be locked together.

The invention will now be explained in more detail with reference to the drawings.

Fig. 1 shows a frame structure 1 consisting of a sill member 2, a head member 3 and jambs 4, 5 at the ends of the sill member 2 and head member 3. In the illustrated case two sliding panels 6, 7 are provided. These may be opaque, translucent or transparent, i.e., provided with, e.g., glass areas 6', 7'. Thus, in the frame structure 1 there are thus two sliding panels 6, 7, in the case of the illustrated example in the form of sliding doors capable of moving relative to one another. Of course, it is also conceivable that one of the sliding panels, e.g., the panel 7 may be replaced by a panel mounted fixedly in the frame structure, whilst the other panel 6 is movable.

The sliding panels 6, 7 are guided to their desired movement by means of guide tracks 8, 9 as shown for the sill member 2. Corresponding guide tracks (not shown) will also be found in the downward facing side of the head member 3.

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In a closed position it is important that the sliding panels can be locked relative to the frame structure 1. One end portion of the sliding panels 6, 7 is therefore preferably equipped with a lock case, indicated by means of the reference numerals 10 and 11 respectively in Fig. 1, and which can engage with a striking plate, such as the striking plate 12 for lock case 11. If there is a question of extra security, the opposite end of the sliding panel can be provided with a locking device consisting of a lock case 13 on the door which is closest to the inside of the house in which the sliding door construction is mounted and an associated striking plate 14 in the sliding door 7 that is outermost. If, for instance, the sliding door 7 is not movable but constitutes a fixed panel in the frame structure, as will be discussed later in connection with other embodiments of the invention, other locking means can be used instead of the lock case 13 and the striking plate 14.

Although the construction as shown in Fig. 1 in certain cases may be advantageous, perhaps the most common sliding panel construction is fabricated having a fixed part 15 and a movable part 16, as shown in Fig. 2. If two sliding panels are employed, as shown in Fig. 1, it will be easier to clean the outside of the sliding panels. Irrespective of which version is chosen, i.e., either with two movable sliding panels 6, 7, as shown in Fig. 1, or with one movable sliding panel 16 and a fixed panel 15, as in Fig. 2, it will be necessary to have a rebate 17 in the centre of the frame 18, as shown in Fig. 3 for the sill member and head member 19, 20, respectively. However, it is also essential that an efficient seal can be made between the rear stile 16' of the sliding door and the adjacent

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stile 15' of the fixed panel 15 when the sliding panel 16 is in the closed position as is shown in Figs. 2 and 4. To this end, the stile 15' is provided with a rebate 24 against which the weather stripping 23 of the sliding panel 16 bears.

- 5 Although the sliding panel construction as shown in Figs. 1 and 2 has a frame structure 1; 18, this frame structure may conceivably be replaced by a floor, ceiling/ceiling rafter and opposite walls in a building structure. To be able to move at least one sliding panel, carrying wheels are necessary. There must be at least two carrying wheels for each sliding panel, preferably arranged at the end portions of the sliding panel.

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- As shown in Fig. 4, there is a fixed panel 15 and a movable sliding panel 16 which can be moved along the rebate on carrying wheel 25 which runs along a guide rail 26 provided in the sill member 19. A lock and optionally an espagnolette mechanism 27 may be fitted in the end stile 16'' of the sliding panel 16 which is to face towards the jamb 21 of the frame structure. To obtain an efficient seal between the rebate 24 and the weather strip 23, it is also important that the stile 16' is drawn towards the stile 15' and secured there. For this purpose, the use of a safety fitting is proposed which is intended to function as a rear edge fitting for the sliding panel. This safety fitting consists of a female part 28 which is intended to interact with a male part 29. To facilitate the understanding of the interaction between the female part and the male part, reference is made to Figs. 32-35. The female part 28 is made with a hole 28' which is oblique relative to the mouth of the hole. The mouth forms an angle with the plane of the panel 15. A portion 28'' around the mouth of the female part is rounded and somewhat indented relative to the other portions around the mouth. This means that the rounded portion 28'' is closer to the bottom of the hole 28' than the other portions at the mouth. In the illustrated embodiment, the female part is secured to the stile 15' of the stationary panel 15. The male part 29 is made having an oblique, projecting pin 29' which forms an angle with the plane of the sliding panel 16 and extends in the direction of the stile 16'' on the sliding panel 16. During longitudinal and simultaneous lateral movement of the sliding panel 16, the pin 29' will engage or disengage with said hole 28' in the female part 28. The male part 29 is to advantage mounted on the stile 16' of the movable panel 16. If an embodiment with two movable panels were used, the female part 28 could, for instance, be arranged on the sliding panel 6, whilst the male part 29 could be arranged on the sliding panel 7. As shown in Figs. 32, 34 and 35, the projecting pin 29' of the male part may be made adjustable in the direction of movement of the sliding panel. To this end, the male part may be bipartite with a retention piece
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29" and a sliding piece 29". The male part can be provided with an adjusting screw 30 which can be operated with the aid of an Allen key 31.

By affixing the weather strip 23 as shown in Fig. 4, it is made difficult for water to enter the space between the stiles 15' and 16' and penetrate further into the space between these stiles. If the weather strip 23 had been placed further to the right on the figure, water would easily have remained in the space between the stiles 15' and 16'. It is also important that on the stile 15' there is a contact portion 24 or rebate parallel to the direction of movement of the sliding door, thus ensuring that a best possible sealing area is obtained.

In the solution shown in Fig. 3, the sliding panel 16 is supported on carrying wheels 25. However, it is important to ensure an efficient and desired control of the movement of the sliding panel 16, and for this purpose there is also provided a guide rail 32 in the head member 20.

The guide rail 32 has tracks designed for guiding a guide castor 33. In a similar manner, the rail 26 also has a track 26' intended for a guide castor 34 which extends downwards from the underside of the sliding panel 16.

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In Figs. 5-8 a sliding panel construction is shown having frame 35 including a sill member 36, head member 37 and jambs 38, 39. In the illustrated embodiment there is a panel 40 fixedly mounted to the frame structure 35 and a movable panel 41. In relation to the construction shown and described in connection with Figs. 2-4, the embodiment according to Figs. 5-8 differs from that in Figs. 2-4 in that the sliding panel has carrying wheels 42 made in the form of suspension wheels which run in a rail 43 mounted in the head member 37. The suspension wheels 42 form a pivotal connection with a suspension fitting 44 which is secured via a screw connection 45 in the top edge of the sliding panel 41. An adjusting nut 46 and the screw connection 45 permit height and angular adjustment of the sliding panel relative to the frame structure 35. As shown at the bottom of Fig. 6, the sill member of the door frame may have a guide pin 47 which engages with a guide rail 48 in the bottom of the sliding panel 41. As can be seen clearly from Fig. 6, this embodiment involves a solution where the sliding panel slides along an outer rebate 49, instead of along an inner rebate, as indicated in Fig. 3. For this reason, it may be advantageous to place the guide track 48 on the underside of the sliding panel instead of in the sill member 36 in order thereby to avoid the guide track becoming filled with contaminants, e.g., water which freezes and turns into ice, sand or

another obstacles which prevent free movement of a wheel in a rail of this kind. As with the embodiment in Fig. 3 (see also Fig. 42), where the carrying wheel 25 is laterally movable along an axle 50, it will also be necessary in the case of the embodiment in Fig. 6, where the carrying wheels are provided on the upper side of the sliding panel, to allow the suspension fitting 44 to be laterally movable relative to the axle 51 of the suspension wheels 42. Without said sideways movability, it would not be possible to undertake a sideways movement of the sliding panel by using guide castors/guide tracks or guide pins/guide tracks. In the embodiment that can be seen from Fig. 8, the safety fitting 28, 29 is mounted the other way around, i.e., that the female part 28 is fixedly mounted in the sliding panel with its oblique hole 28' facing in the direction of movement of the sliding panel towards the jamb 39. The male part 29 is fixedly mounted in the panel 40 with the projecting pin 29' facing away from the jamb 39. This manner of mounting shown in Fig. 8, which is the reverse of that shown in Fig. 4 and also Figs. 32, 33, is due solely to the consideration of a simple adjustment facility for the male part 29, whilst the adjustment facility of the safety fitting will not be accessible other than from the inside of the sliding panel construction.

If Fig. 8 is studied, it will be appreciated that when the sliding panel 41 is pushed towards the left, the guide track 48 which at its end portion is curved, will follow the guide pin 47 and thus move the panel 41 sideways at the same time as it moves in a longitudinal direction. Thus, the female part 28 will run clear of the male part 29 so that the sliding panel 41 can be moved freely in the frame structure 35. A similar guide track 48 and guide pin 47 may of course be provided at the portion of the head member and sill member and also the top and bottom of the sliding panel 41 which is closest to the jamb 39. In the case illustrated here, only one guide track 48 and one guide pin are used. This is made possible through the use of a turning piece 52 for guiding the panel 41 into sealing contact against the jamb 39. This function will now be described in more detail in connection with Figs. 38-41. The said turning piece 52 is shown mounted in a depression in the jamb 39, and apart from a stop cam 52' it is essentially kidney-shaped, seen in horizontal section. Close to the bottom of its indentation 52'', the turning piece 52 is pivotally mounted via a spindle 53 in a bracket 54 on the guide fitting. The turning piece 52 is partly pivotal into the jamb 39. The sliding panel 41 is provided with a recess 55 in a stile portion which faces towards the jamb 39 and is also provided with a striking plate fitting 56, with which the said turning piece 52 is to engage. When a first portion 52''' engages with the striking plate 55, the turning piece 52 will begin to turn counter-clockwise as seen in Figs. 38-40. A second portion 52'''' will thus begin to move into the recess 55 and come to bear against a portion of the

striking plate 56 located in the longitudinal direction of the sliding panel.

Consequently, when the sliding panel 41 is pushed more to the left, as seen in Figs. 38 and 39, the turning piece 52 will turn more and more counter-clockwise and the portion 52''' of the turning piece 52 will force the sliding panel to move transverse to its longitudinal direction of movement. Through the use of guide pin 47 and guide track 48, there is produced simultaneously a controlled movement of the sliding panel in the final phase of the transverse movement. When the turning piece 52 is in the position which is evident from Fig. 40, it has come into a locking position. A sliding movement transverse to the longitudinal direction of the sliding panel will be counteracted by the position of the turning piece relative to the striking plate 56.

In the solution shown in Figs. 9-12, the sliding panel is indicated by means of the reference numeral 57, whilst the fixed panel is indicated by means of the reference numeral 58. As shown and described in connection with Figs. 5-8, in this case too, the bottom edge of the sliding panel 57 will be provided with two guide tracks 48 and 48' which, by engaging with two guide pins 47, 47', will provide a movement transverse to the longitudinal direction of movement of the sliding panel for sealing contact with the frame structure 60, i.e., with the sill member 61, head member 62 and jamb 63 thereof and also with the stile portion 58' of the fixed panel 58 which has a sealing rebate portion 64. The weather strip 23 of the sliding panel will also come to bear against the rebate portion 65 of the frame structure. Here, it will be seen that the pin 47' which is closest to the jamb 63 is designed to engage only with the curved guide track 48', whilst the pin 47 is intended to engage with both the straight and the curved portion of the guide track 48.

Where an overhead rail 48 is employed, e.g., as is shown in Figs. 5-12, it will also be necessary to secure the movements of the sliding panel 41; 57 at the top edge thereof. For this purpose, the overhead rail 43 is equipped with guide tracks 118, 119 which extend the length of the rail on the underside thereof. To bring the sliding panel 41; 57 in towards the frame structure in a locking position, portions are milled out in the underside of the rail 43 for securing guide plates 120, 121 having curved guide tracks 122, 123. On the upper side of the panel 41; 57 there are provided guide pins - or castors 115, 116 which extend upwards into sliding engagement with respective tracks 118, 122 and 119, 123.

Figs. 13-15 will now be explained in more detail in association with what has been taught and described in connection with the embodiment in Figs. 2-4. A person versed

in the art will understand immediately that the embodiments in Figs. 5-8 and 9-12 represent technical equivalents of that shown in Figs. 2-4 and 13-15. Figs. 13-15 are also related to the section IV-IV in Fig. 2 which corresponds to Fig. 4.

- 5 Although Figs. 13-15 will only be explained in connection with the guiding associated with the guide track 26' and the guide castor 34, it will however be appreciated that corresponding means are also found at the upper side of the sliding panel, represented by the guide track 32 and the guide castor 33, see Fig. 3. The solution is also applicable when using overhead rail 63, guide tracks 118, 119 and with interacting guide pins 115,  
10 116 at the upper side of the sliding panel.

The sill member 19 has two rail bodies 26, 26' and 66, 66' positioned one after the other along its entire length in the longitudinal direction, as indicated in Fig. 13. The rail part 26, respectively 66, serves as support for carrying wheel 25, whilst the rail part 26'  
15 serves as guide track for guide castor 34, respectively guide castor 67. At each end portion of the guide track 26'; 66' that is closest to the jamb 21, there is provided a curved, final guide track portion 26"; 66". When the sliding panel 16 is pushed to the left, as shown in Figs. 13 and 14, the guide castors 34 and 67 will gradually pass from the straight portion of the guide tracks 26', 66' to the curved portions 26", 66", whereby  
20 the sliding pane 16 will move transversely at the same time as it is pushed in the longitudinal direction, so that ultimately it bears against the jamb 21, as shown in Fig. 15. In this position, the weather strips 23 will come into sealing contact with the sill member 19, jamb 21 and head member 20 of the frame structure 18, and also the stile 15' of the fixed panel. By virtue of the fact that the carrying wheel 25 is at the same  
25 time movable on its axle 50, as shown and described in connection with Fig. 42, a composite movement of the sliding panel is obtained which makes possible an easily movable sliding panel that provides good sealing. For further details, reference is made to Figs. 36 and 37 among the figures in this description. As indicated in connection with Figs. 1 and 2, it will be desirable to be able to provide a locking device for a  
30 sliding panel. It will also be expedient to allow such a locking device to interact with an espagnolette mechanism.

For a more detailed explanation in connection with the locking device, reference will be made to Figs. 18-22. The lock case is indicated by means of the reference numeral 68  
35 and preferably has an espagnolette mechanism connected thereto, although this is not an absolute condition. The espagnolette mechanism has vertically movable bolts 69 and 70 which via articulations 71 and 72 form a connection with a rotating mechanism 73 in the

lock case 68. The rotating mechanism 73 has a dead bolt 74 that is rotatable thereto in the vertical plane. The bolt 74 is designed to engage with a striking plate 75 which is preferably fixed to a jamb, such as the jamb 21. The dead bolt 74 is initially designed for a turning movement through an angle of about  $90^{\circ}$  and outermost is made having a thickened portion 74'. The striking plate 75 has an insertion opening 76 which has a first portion 76' of a first width which merges into a second portion 76". The second portion is oblique along essentially its entire length, and has another, smaller width which is greater than the thickness of the dead bolt 74, but smaller than the width of the thickened portion 74' of the bolt 74. On the back of its front portion, the striking plate 75 has a curved contact portion 77. The inclination of this curved contact portion may optionally be adjustable with the aid of an adjusting screw 78. The contact portion 77 with its backward facing side is to serve to engage with the thickened portion 74' of the dead bolt 74, so that when the bolt 74 is in abutment with the contact portion 77, it will not be capable of being drawn out of the striking plate 75 owing to the thickened portion 74', provided the bolt is not turned down into the position shown in Fig. 17. The said contact portion 77 thus extends in a direction along the said second portion 76" of the insertion opening.

At the first portion 76' of the insertion opening 76, the striking plate 75 has an oblique slide plate 75'. This slide plate 75' will form sliding contact for the thickened portion 74' of the dead bolt 74 when it is moved into or out of the striking plate. However, when the bolt 74 is moved down and out of the striking plate 75, the slide plate 75' will help to push the sliding panel a little away from the jamb 21 to draw the sliding panel out of sealing engagement with the frame structure. Similarly, during the movement of the dead bolt 74 into the striking plate 75 and into engagement therewith 75, the sliding panel 16 will have forced motion both in the longitudinal direction of the sliding panel, in that the thickened portion 74' of the dead bolt 74 will come to bear against the contact portion 77 in the striking plate 75, at the same time as the second portion 76" of the insertion opening is oblique along essentially its entire length. In Fig. 21 it will be seen that the thickened portion of the bolt 74 will remain at the back of the second part of the insertion opening 76 and also behind the contact portion 77. By manipulating the adjusting screw 78, it will be possible to change the inclination of the contact portion 77, which may be a useful aid to the fine adjustment of the engagement of the bolt with the striking plate 75.

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Figs. 19 and 20 show how the dead bolt 74 with its expanded portion 74' has come into full engagement with the striking plate 75 with the aid of its contact portion 77. Fig. 21

is an end view of the sliding panel with the locking device and possible espagnolette mechanism.

When the bolts 69, 70 of the espagnolette mechanism are to engage with striking plates in respectively the sill member and head member in a frame structure, it is important  
5 that they have a controlled movement into the striking plate. To this end, it is proposed, as shown in connection with Figs. 23-26, to allow an end portion of the bolt, in this case bolt 70, to be chamfered. When the bolt is guided down into the opening 79 in the striking plate, it will be expedient to equip a striking plate 82 with journalled balls 80,  
10 81. The position for these journalled balls could be made adjustable, since they are attached to the striking plate 82 by means of a threaded connection. The striking plate 82 may also contain the curved guide track 26". The striking plate 82 may be made adjustable in the longitudinal direction of the sliding panel by means of adjusting screws 83, 84 which extend through elongate adjusting grooves 85, 86 in the striking plate 82.  
15 The balls 80 and 81 are rotatable on their mountings 80', 81'.

As shown in Fig. 23, the guide track will have a first curved portion 111 and a second curved portion 112. When closing the sliding panel 16, the guide castor will follow the curve 112 and thus force the sliding panel in against both the rebate and the rest and in  
20 position for the bolts of the espagnolette lock, such as the bolt 70. The curved portion 111 will function in a similar manner when the sliding panel is opened. When the bolts in the espagnolette lock, such as the bolt 70, slide down, the chamfered portion 70' at the bottom of the bolt 70 will slide against the two journalled balls 80, 81 and thus also force the sliding panel into a movement at an angle of about 45° relative to the direction  
25 of movement of the sliding panel towards the rebate and rest in the frame. The curved portions 111 and 112 have a radius of curvature and design such that when the bolt, e.g., the bolt 70, and the balls 80, 81 take over the control of the direction of movement of the sliding panel, clearance 113 will arise between the guide castor 34 and the curved portions 111, 112 of the guide track 26", thereby ensuring that the guide rollers do not  
30 come under any strain of force between the closing and opening function, i.e., in the closed position of the sliding panel.

It will be necessary to be able to make vertical adjustments of the position of the guide castors which are to engage with the guide tracks, depending upon the distance of the  
35 sliding panel from respective guide tracks. In Figs. 27-29 it is shown how this can be done in practice. On the left in Figs. 27, 28 and 29 it is shown how the mounting for the guide castors 33, 34 can be integrated into the espagnolette fitting. The guide castors

33, 34 can be actuated by a spring 33' respectively 34'. A set screw 33'', respectively 34'', may be used to secure the guide castor 33, respectively 34, in the desired position. Loosening and tightening the set screw 33'', 34'' can be done with the aid of a tool, e.g., an Allen key 87. On the right in Figs. 27, 28 and 29 an alternative mounting bracket for the guide castors 33 and 34 is shown. In this case, the mounting bracket is inserted from the side of the sliding panel and is for the sake of simplicity indicated by means of the reference numerals 88 and 89. These brackets may be identical per se.

In order to be able to swing a sliding panel 90 or 91 into place in a frame structure 92, which has a head member 93 and a sill member 94, it is important that the guide castors 33 can be lowered so that they run clear of the bottom side of the head member when they are swung into place, as is shown in Fig. 30. It will be understood immediately that in connection with a sliding door which faces towards the outside, it is important that it is not possible to gain access to the guide rollers and adjust them so that they disengage from the guide track. The adjustment of the vertical position of the guide castors should therefore be carried out either from the inside of the sliding panel or from its end edge, as is shown in Figs. 27-29. However, in Fig. 31 adjustment with the aid of a tool 87 which can operate a set screw is shown.

Alternatively, the guide castor 33 may conceivably be supported by a bar 95 made, at least along a lower portion, in the form of a toothed bar which can engage with an adjusting wheel 96 that is capable of being manipulated with the aid of a tool 87, e.g., an Allen key.

As a further alternative, there may be a hexagonal portion below the actual guide castor 33, which can engage with an Allen key 97, so that by turning the Allen key 97 the guide castor 33 can be raised or lowered, in that it is supported by a screw member 98 which forms threaded engagement with a holder 99 which is secured in the top edge of the sliding panel. However, it will be understood immediately that the solutions shown in Fig. 31 could equally well be secured from the side of the sliding panel as from the top.

As is shown in connection with Figs. 46-48, there may be a need for height adjustment of a sliding panel in an opening in a frame structure, where for the sake of simplicity only the sill member 19 and head member 20 are shown. The adjustment may be necessary for purely aesthetic reasons, but may also be desirable owing to practical considerations such as the wind and the weather. Fig. 46 shows the sliding panel 16 in a

typical intermediate position, whilst Figs. 47 and 48 show the sliding panel in a lower position and an upper position respectively. To be able to carry out such a height adjustment in an efficient manner, according to the invention a technical solution is proposed which is evident in particular from Figs. 42-45 and from the paragraphs  
5 below.

Although conceivably adjustability of just one carrying wheel could be used, it is proposed according to the invention to use a pair of carrying wheels 25, 25' close to the end portions of the sliding panels. The carrying wheels 25, 25' are arranged in a bogie,  
10 pivotally mounted in a fork 100. The fork 100 is movable in a pocket 101 in a carrying wheel housing 102. As previously described, the wheels 25, 25' are laterally movable along the axle 50, so that the sliding panel will be movable transverse to its longitudinal direction of movement when such movement is dictated by the guide castors and guide tracks or guide pins and guide tracks, as has also been shown and described earlier.

15 To prevent the fork 100 and the mounted wheels 25, 25' from falling out of the pocket 101 in the housing 102, the fork is provided on both sides with an elongate, vertical groove or slot 103 for sliding engagement with a peg 104 which extends into the gap 103 on each side of the opening 101. Uppermost, the fork 100 has a protuberant portion  
20 105 having a specific outer radius of curvature. The height adjustment can be carried out with the aid of an adjusting disc which is eccentrically mounted and preferably has an asymmetric form in other respects. This disc is shown in more detail in Fig. 43 where it is indicated by means of the reference numeral 106. Along its periphery, the disc 106 recessed portions such as, e.g., the portions 106' and 106''. These recessed  
25 portions 106'' are preferably given the same radius of curvature as the protuberant portion 105 on the fork 100. When the disc 106 is turned about a support 107 with the aid of a turning tool 108 which can engage with a hole 109 in the mounting of the disc, it is possible to determine which of the recesses, e.g., 106' or 106'', is to engage with the protuberance 105 on the fork 100. An examination of Fig. 43 will reveal that if the disc  
30 is turned clockwise, the fork 100 and so the wheels 25, 25' will move downwards relative to the bottom edge of the panel 16, whilst turning the disc counter-clockwise will cause the fork to move upwards in the housing 102. Extra locking of the height adjusting disc 106 is not necessary since the sliding panel rests with its weight on the connection between the protuberance 105 and the disc 106. Similarly, the curvature of  
35 the protuberance 105 and the recesses 106', 106'' on the disc 106 are made so that the stepwise snap engagement for different height adjustments does not require particularly great manoeuvring forces.



As shown and described in connection with Fig. 1, which shows in particular two sliding panels capable of moving relative to one another in a frame structure 1, a locking mechanism 13, 14 is proposed. This is shown in somewhat more exemplary detail in Fig. 49. The locking mechanism may consist of a dead bolt 13' having an expanded end portion 13'' adapted to engage in the striking plate 14, and where the said expanded portion 13'' engages behind an edge of the striking plate 14, so that the bolt in this position cannot be withdrawn from the striking plate. The dead bolt is preferably movable through an angle of 90° with the aid of a handle 13'''. The handle 13''' can optionally be locked in its position by means of a locking cam 110 which is found on the sliding panel 7 at the location of the striking plate.

The illustrated weather strip, e.g., the weather strip 23 on Fig. 3, may be made of soft rubber and with a fixing plate and weather moulding 23' of hard rubber. The seal tubing is secured uniformly to the weather moulding in order to provide a wall and prevent the infiltration of water, at the same time as the weather strip allows great height adjustability, as can be seen from Figs. 46-48. Furthermore, the design of the weather strip permits sealing around all the corners of a sliding panel. The other vertically mountable portion of the weather strip is covered with the seal tubing, so that the last-mentioned can be lifted up and allow invisible nailing, as is indicated, for instance, on Fig. 36.

By using a turning piece construction as shown and described in connection with Figs. 38-41, it will be possible, if so desired, to dispense with espagnolette locking for locking the sliding panel to the frame at the top and bottom thereof.

By making the frame structure with a rebate 114 in the centre, as is shown for instance in Fig. 31, it will be possible to allow the sliding panels in the transverse direction to be pressed and sealed against the rebate 114 from both the inside and the outside of the rebate. A frame profile of this kind has been found to be especially advantageous in connection with the present invention.

Thus, by means of the present invention there are provided technical solutions in connection with a sliding panel construction, whether one or more sliding panels are used in connection with a frame structure. Thus, by means of the invention there are provided adjustable fittings which handle the final guiding (the transverse movement of the sliding panel) and where there is also the possibility of adjusting the pressure on the

seal which the sliding panel must have at all four corners. In actual fact, each corner of the sliding panel is separately adjustable. Moreover, the present invention is of a design that is simple in mechanical construction, has few movable parts and requires minor modifications of the frame structure and the sliding panel. As shown in connection with  
s the locking device, the striking plate is adjustable, so that a controlled pressure on the seal is obtained.

Patent claims

1.

5 A device for longitudinal movement of a sliding panel, e.g., a sliding door or sliding window, in a frame structure, and simultaneous lateral movement of the sliding panel at an end position where it practically closes an opening in the frame structure, characterised in

10 that a first set of guide castors is provided at the top and the bottom of the sliding panel at a first end portion thereof, and a second set of guide castors is provided at the top and bottom of the sliding panel at a second end portion thereof, each guide castor having a vertical axis of rotation;

that carrying wheels are provided on the underside of the sliding panel at said first and second end portions, and where the carrying wheels are laterally movable and pivotally mounted on a horizontally disposed axle;

15 that the sill member of the frame structure has two rail members positioned one after the other in the longitudinal direction;

that each rail member consists of a guide track intended for guide castors which are provided on the underside of the sliding panel and a supporting rail for the carrying wheels of the sliding panel, each guide track, closest to a vertical portion of the frame structure with which the sliding panel in closed position meets, being extended by  
20 means of a curved, laterally directed guide track for forced motion of the sliding panel in a lateral direction at said end position; and

that the head member of the frame structure has two rail members positioned one after the other in the longitudinal direction and made in the form of guide tracks for guide  
25 castors provided on the upper side of the sliding panel, each guide track, closest to the vertical portion of the frame structure with which the sliding panel in closed position meets, being extended by means of a curved, laterally directed guide track for forced motion of the sliding panel in a lateral direction at said end position thereof.

30 2.

A device for longitudinal movement of a sliding panel, e.g., a sliding door or sliding window, in a frame structure, and simultaneous lateral movement of the sliding panel at the end position, where it practically closes an opening in the frame structure, characterised in

35 that carrying wheels designed as suspension wheels having a horizontal axle are movably mounted in an overhead rail secured to the head member of the frame structure

and form a connection with the upper side of the sliding panel at said first and second end portions via a respective mounting movable along the carrying wheel axle; that that underside of the sliding panel has a rail member positioned in a longitudinal direction, designed as a guide track for a guide castor or guide pin provided on the sill member of the frame structure, wherein the guide track, furthest from the vertical portion of the frame structure with which the sliding panel in the closed end position meets, is extended by means of a curved laterally directed guide track for forced motion of the sliding panel in a lateral direction at said end position thereof; that the overhead rail is equipped with two guide tracks positioned one after the other in the longitudinal direction and facing towards the upper side of the sliding panel; that the upper side of the sliding panel has guide castors or guide pins for sliding engagement with respective guide tracks in the overhead rail; and that means, e.g., guide fittings, espagnolette fittings and/or a guiding locking device are provided to guide the end portion of the sliding panel which is closest to a jamb in the closed position of the sliding panel sideways for sealing contact with the frame structure.

3.

A device for longitudinal movement of a sliding panel, e.g., a sliding door or sliding window, in a frame structure, and simultaneous lateral movement of the sliding panel at the end position, where it practically closes an opening in the frame structure, characterised in that carrying wheels designed as suspension wheels having a horizontal axle are movably mounted in an overhead rail secured to the head member of the frame structure and form connection with the top of the sliding panel at said first and second end portion via a respective mount movable along the carrying wheel axle; that the sill member of the frame structure has two guide pins or guide castors designed for sliding engagement with two rail members positioned one after the other in the longitudinal direction on the underside of the sliding panel and made in the form of a first and a second guide track for the guide pins or guide castors, wherein a first guide track that is closest to the vertical portion of the frame structure with which the sliding panel in closed end position meets, is made as a curved, laterally directed guide track for forced motion of the sliding panel in a lateral direction at said end position thereof, and wherein a second guide track positioned between the first guide track and the rear edge of the sliding panel at a portion close to said rear edge is made in the form of a curved, laterally directed guide track in order to be instrumental in the forced motion of the sliding panel in a lateral direction at said portion;

that the overhead rail has two guide tracks positioned one after the other in the longitudinal direction; and

that the upper side of the sliding panel has two guide castors or guide pins designed for sliding engagement with respective guide tracks in the overhead rail.

5

4.

A device for longitudinal movement of a sliding panel, e.g., a sliding door or sliding window, in a frame structure, and simultaneous lateral movement of the sliding panel at the end position, where it practically closes an opening in the frame structure,

10 characterised in

that carrying wheels designed as suspension wheels having a horizontal axle are movably mounted in an overhead rail secured to the head member of the frame structure and form connection with the upper side of the sliding panel at said first and second end portions via a respective mount movable along the carrying wheel axle;

15 that a first guide castor is provided on the underside of the sliding panel at a first end portion thereof, and that a second guide castor is provided on the underside of the sliding panel at a second end portion thereof;

that the sill member of the frame structure has two rail members positioned one after the other in the longitudinal direction provided on the underside of the sliding panel and

20 made in the form of guide tracks for the guide castors, wherein each guide track, closest to the vertical portion of the frame structure with which the sliding panel in closed position meets, is extended by means of a curved, laterally directed guide track for forced motion of the sliding panel in a lateral direction at said end position thereof;

that the overhead rail has two guide tracks positioned one after the other in the

25 longitudinal direction and made in the same fashion as the guide tracks in said successively positioned rail members; and

that the upper side of the sliding panel has two guide castors or guide pins intended for sliding engagement with respective guide tracks in the overhead rail.

30 5.

A device as disclosed in Claim 1, 3 or 4, characterised in that

that means, e.g., guide fittings, espagnolette fittings and/or a guiding locking device are provided to guide the end portion of the sliding panel which is closest to a jamb in the closed position of the sliding panel sideways for sealing contact with the frame

35 structure.

6.

A device as disclosed in Claim 1, characterised in that the carrying wheels are height adjustable.

5 7.

A device as disclosed in Claim 1, characterised in that the carrying wheels are arranged in a bogie which is height adjustable.

8.

10 A device as disclosed in Claim 7, characterised in that at the top the bogie has a defined portion which forms a support site against an adjustable disc mounted in the sliding panel, where the disc along the periphery thereof has support seats for engagement with said portion, and where the support seats are at different distances from the mounting centre of the disc.

15

9.

A device as disclosed in Claim 1, 2, 3 or 4, characterised in that the guide castors are height adjustable.

20 10.

A device as disclosed in Claim 1, 2, 3, 4 or 7, characterised in that the guide castors have a clearance relative to the curved guide track over a final portion thereof.

11.

25 A device as disclosed in Claim 1, 2, 3, 4, 9 or 10, characterised in that the guide castors are spring-loaded.

12.

30 A device as disclosed in Claim 1, 4, 9, 10 or 11, characterised in that the guide castors are a constituent part of an espagnolette lock fitting for the sliding panel.

13.

35 A safety fitting for a sliding panel, such as a sliding door or sliding window, where the sliding panel is movable in a frame structure, either relative to a fixed element which forms a part of the frame structure or relative to a second sliding panel which is movably mounted in the frame structure, characterised in

that the safety fitting comprises a male part intended for engagement with a female part for functioning as a rear edge fitting for the sliding panel;

that the female part is made with a hole that is oblique relative to the mouth of the hole;

that the male part is made with a projecting pin that is oblique relative to its attachment

5 piece and is designed to be complementary with the shape of said hole in order to engage and disengage with said hole on longitudinal and simultaneous transverse movement of the sliding panel.

14.

10 A safety fitting as disclosed in Claim 13, characterised in that the male part is slidably arranged in and is freely adjustable in the longitudinal direction of the attachment piece.

15.

15 A safety fitting as disclosed in Claim 13 or 14, characterised in that a portion around the mouth of the hole is rounded and is closer to the bottom of the hole than the other portions at the mouth.

16.

20 A safety fitting as disclosed in Claim 13, 14 or 15, characterised in that the male part is mounted on the sliding panel and the female part is mounted on the fixed element.

17.

A safety fitting as disclosed in Claim 13, 14 or 15, characterised in that the male part is mounted on the fixed element and the female part is mounted on the sliding panel.

25

18.

A safety fitting as disclosed in Claim 13, 14 or 15 where two sliding panels are used, characterised in that the male part is mounted on one of the sliding panels and the female part is mounted on the other sliding panel.

30

19.

A locking device for a sliding panel, such as a sliding door or sliding window, where the sliding panel is movable in a frame structure either relative to a fixed element which forms a part of the frame structure or relative to a second sliding panel which is movable  
35 in the frame structure, wherein the locking device has a lock case with a dead bolt which is made for turning movement through about 90°, preferably located in the frame of the sliding panel, and a striking plate, preferably located in the frame structure,

characterised in

that the outer end of the dead bolt is made having a thickened portion;

that the striking plate has a bolt insertion opening consisting of a first and a second portion;

- 5 that the first portion has a first width that is wider than said thickened portion;  
that the first portion merges into the second portion which across a substantial part of its length is laterally oblique and has a width that is greater than the diameter of the bolt, but smaller than the thickened portion of the bolt;  
that the striking plate on the back of its front portion has a curved, optionally adjustable,  
10 backward facing contact portion for the thickened portion of the bolt, and wherein the contact portion extends in a direction along said second portion of the insertion opening, and the striking plate at the first portion of the insertion opening has an oblique slide plate which forms sliding contact for the thickened portion of the bolt when it is moved in or out of the striking plate;  
15 whereby the lock case during the movable engagement of the bolt with the striking plate has a composite movement in the direction of the striking plate and at the same time a lateral movement.

20.

- 20 A locking device as disclosed in Claim 19, characterised in that the bolt is articulately connected in the lock case to an espagnolette mechanism.

21.

- A locking device as disclosed in Claim 20, characterised in that the espagnolette  
25 mechanism has bolts having a chamfered end portion, intended for interaction with striking plates which are mountable in the head and sill members of the frame structure, these striking plates each having adjustable guides for the espagnolette bolts, which guides consist of two rotating balls which when the bolt is inserted into its striking plate help to guide the sliding panel forward in its longitudinal direction and sideways at the  
30 same time.

22.

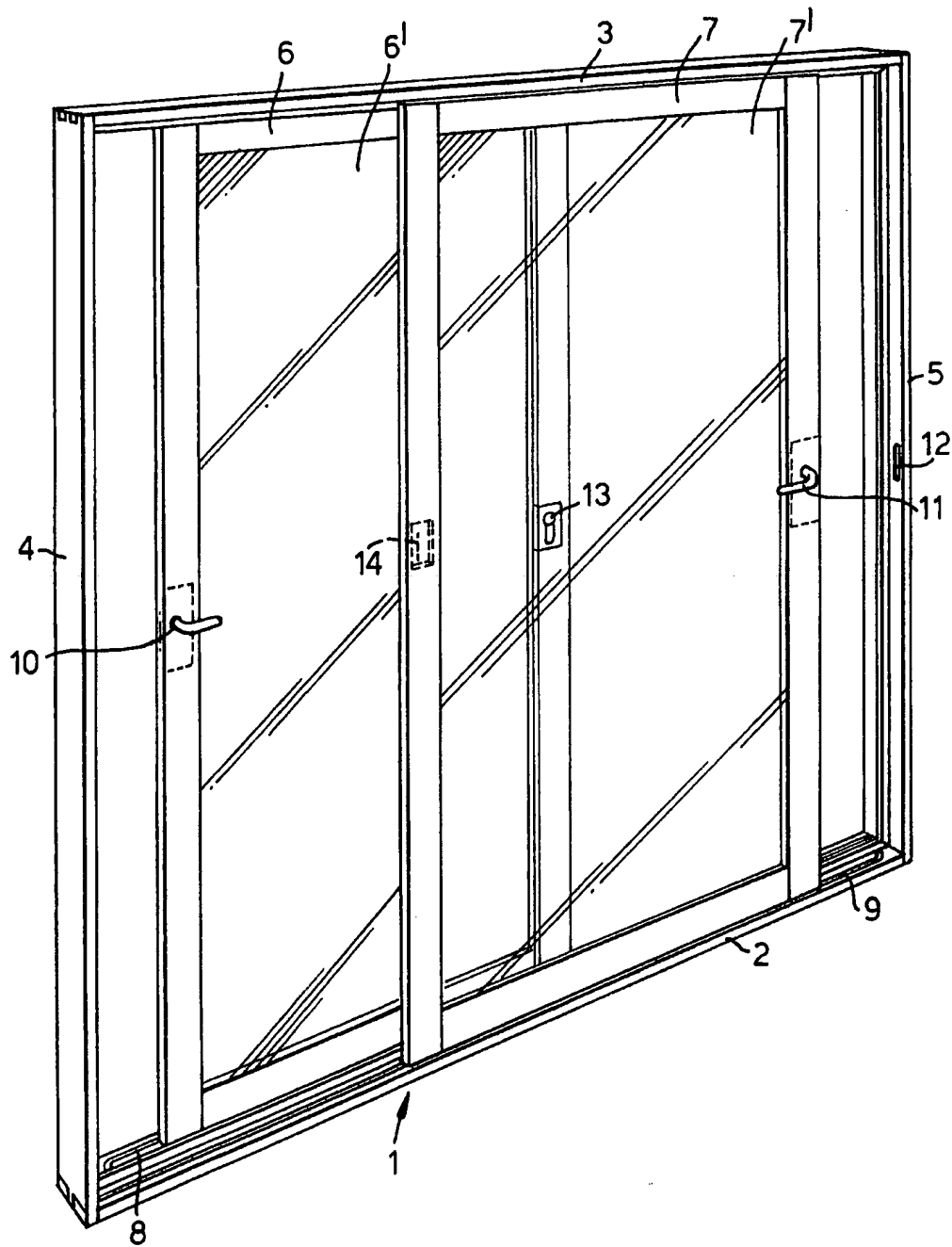
- A guide fitting for a sliding panel, such as a sliding door or sliding window, where the sliding panel is movable in a frame structure, either relative to a fixed element which is  
35 a part of the frame structure or relative to a second sliding panel which is movably mounted in the frame structure, preferably for interaction with a device as disclosed in Claim 1, 2, 3 or 4, or a locking device as disclosed in Claim 19, characterised by a



turning piece, substantially kidney shaped in cross-section and pivotally mounted in a vertical portion of the frame structure, the turning piece, on the sliding movement of the sliding panel theretowards, turning and gripping a rest in the adjacent end portion of the sliding panel and on continued sliding movement forcing the sliding panel on the  
s engagement with said rest transverse to the frame structure, until the end portion of the sliding panel bears against said vertical portion, the turning piece in this position preventing transverse movement of the sliding panel.

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Fig.1.



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Fig.3.

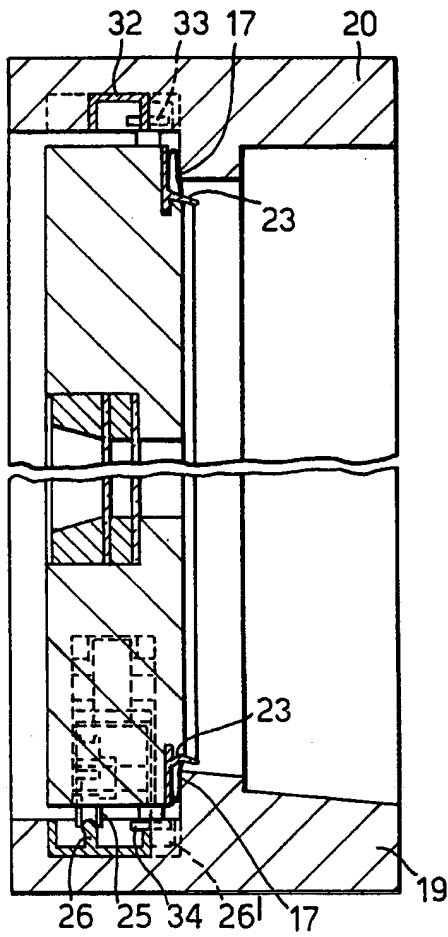


Fig.2.

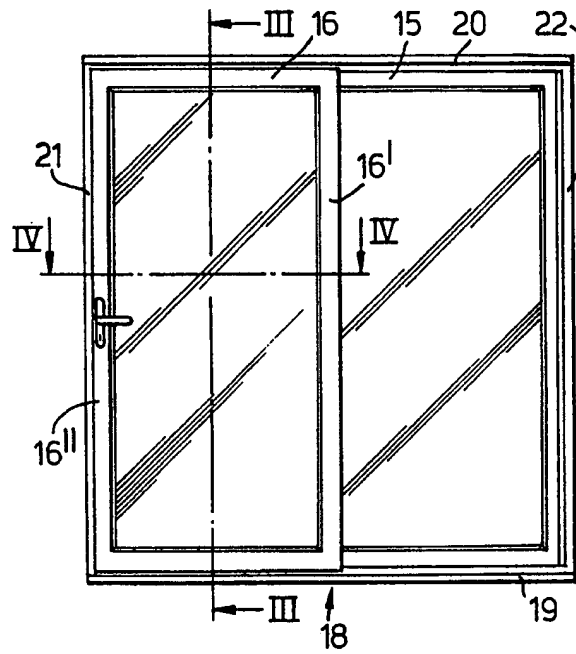
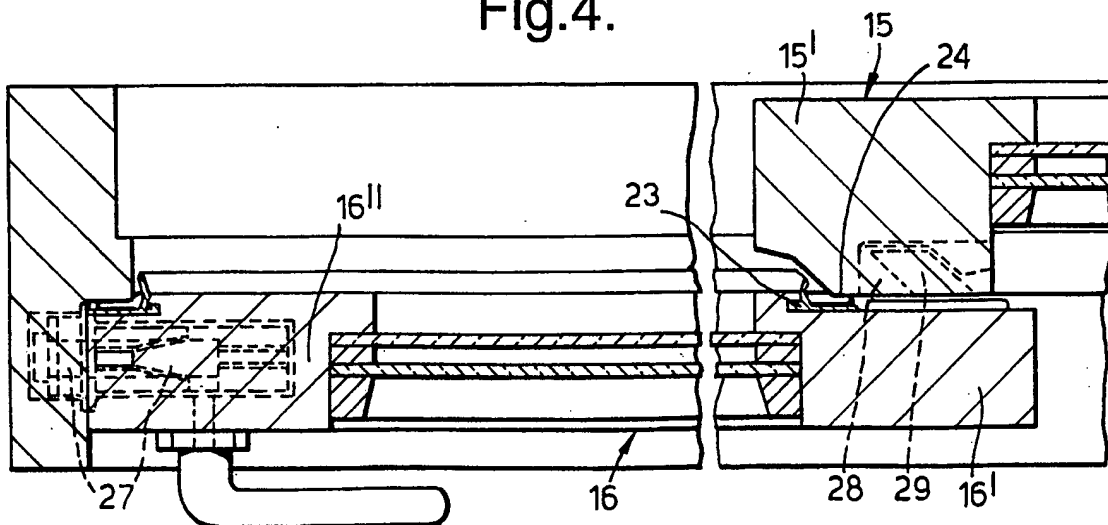


Fig.4.



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Fig.6.

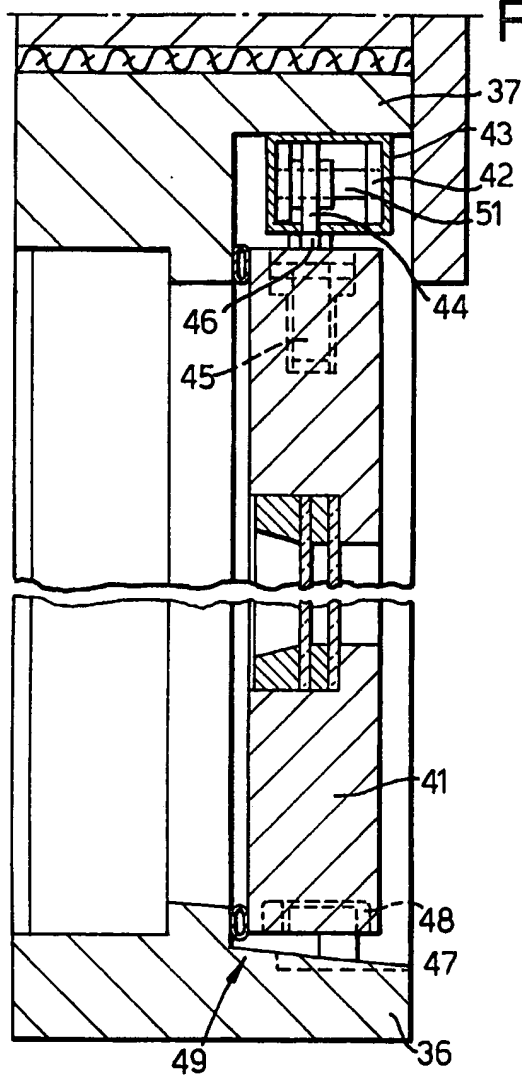


Fig.5.

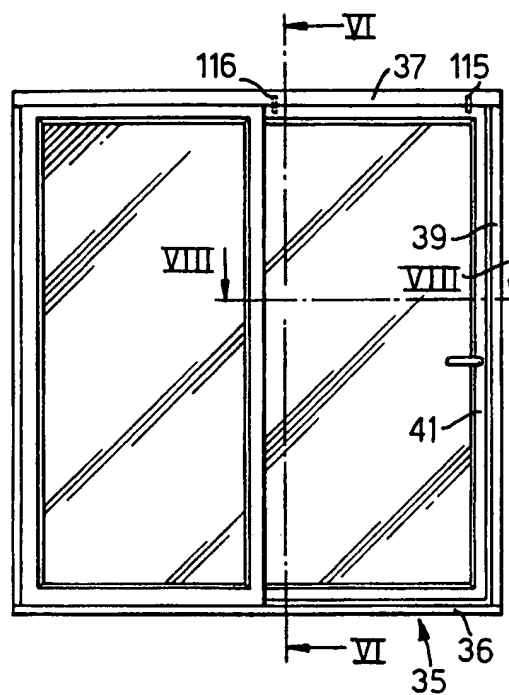
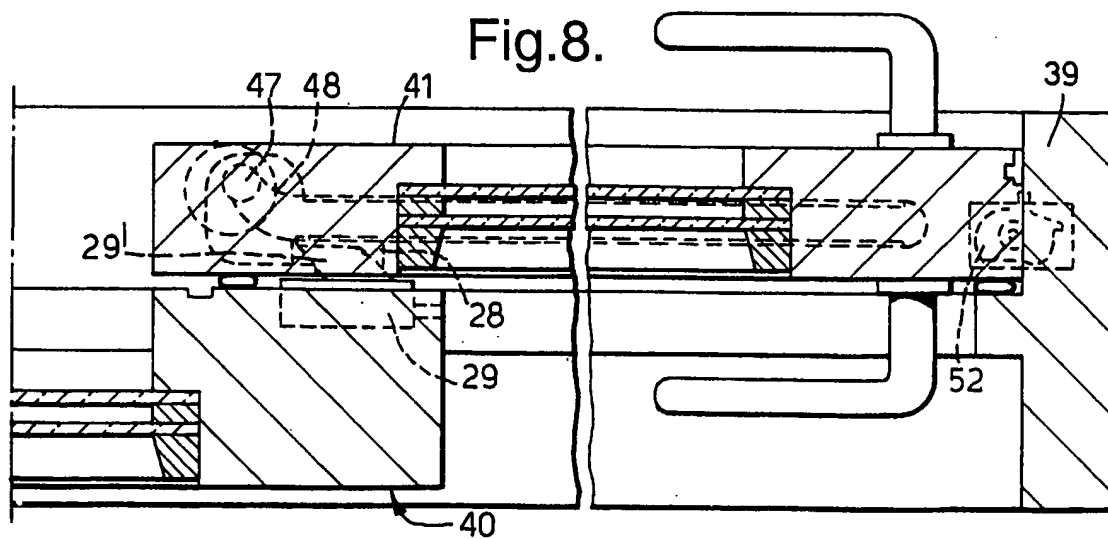


Fig.8.





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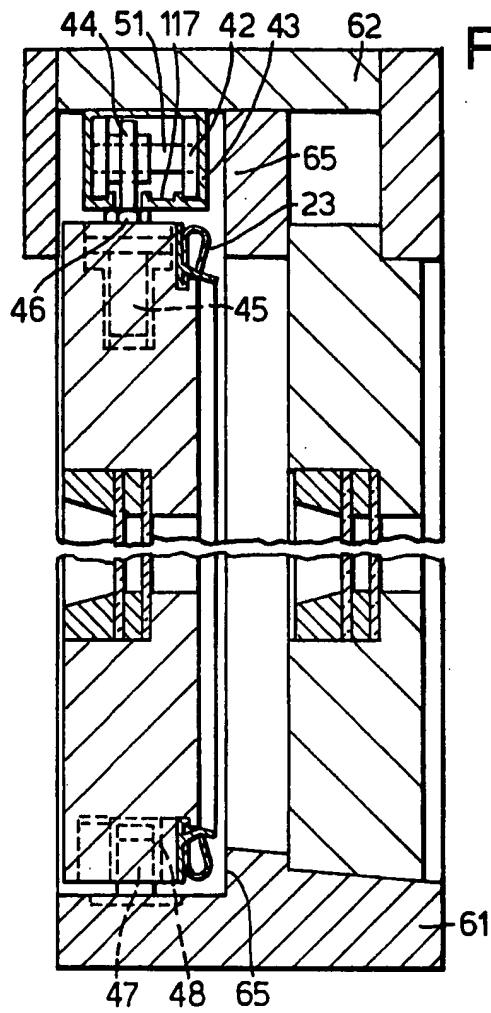


Fig.10.

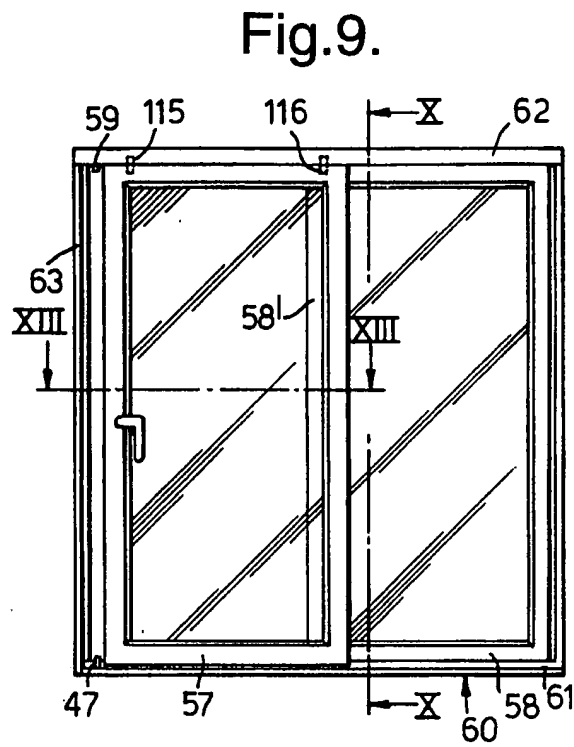


Fig.9.

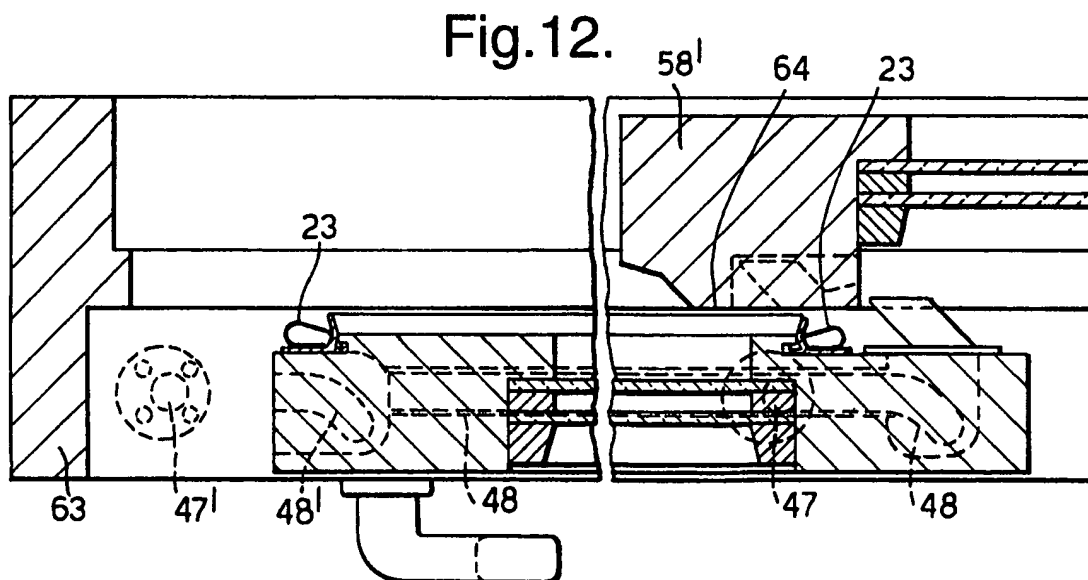


Fig.12.

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Fig.13.

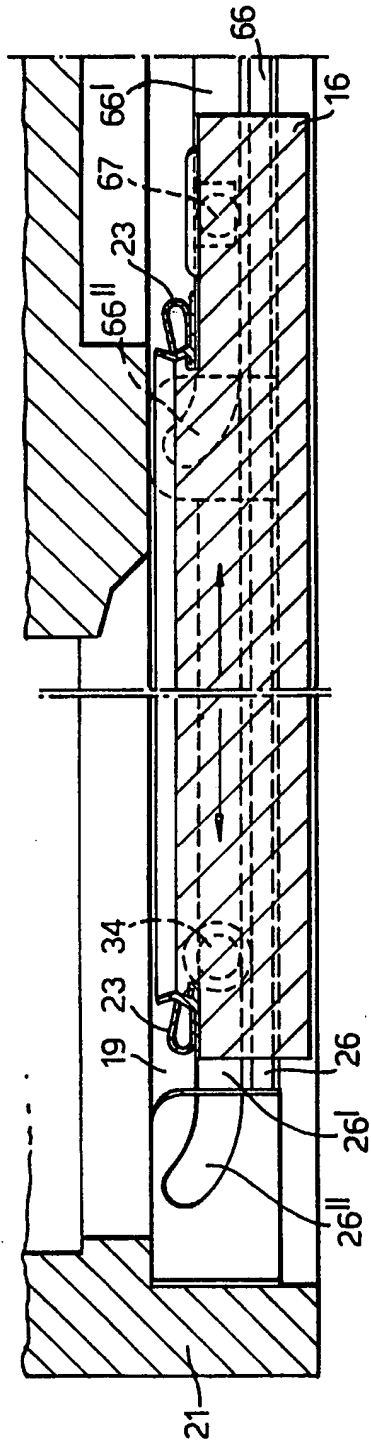
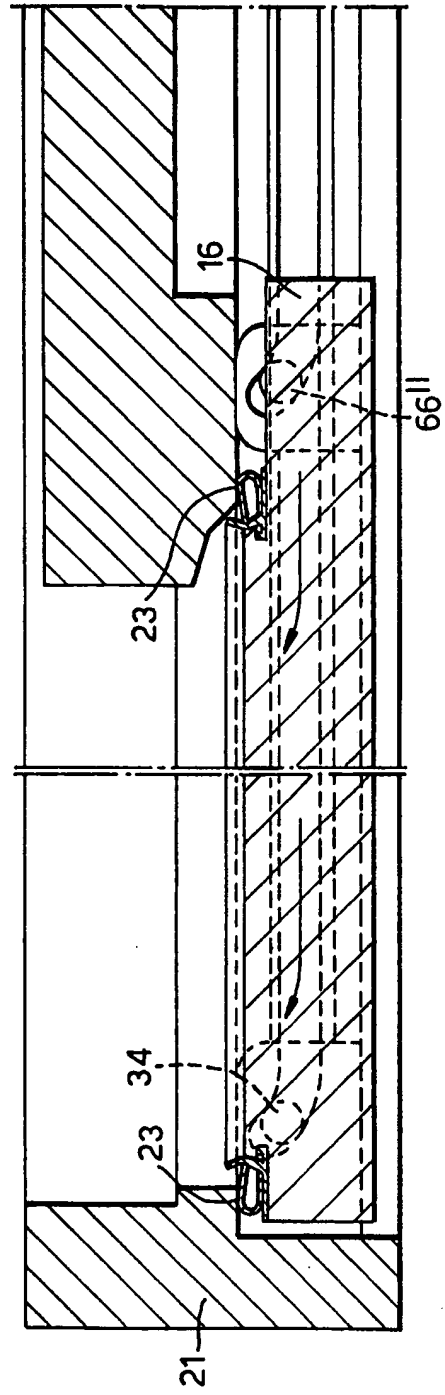
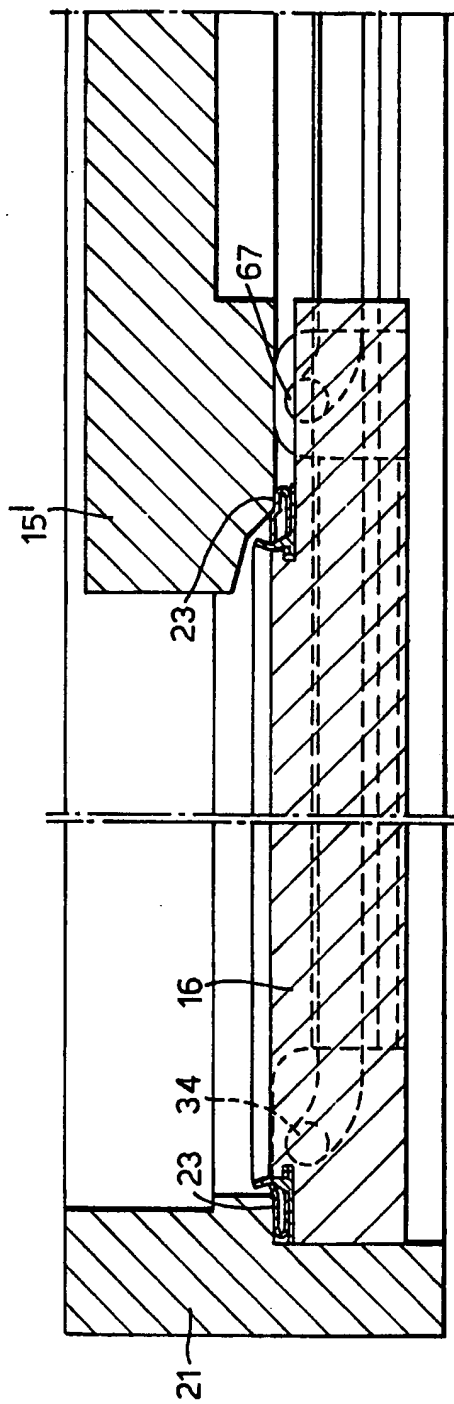


Fig.14.



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Fig.15.





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Fig.16.

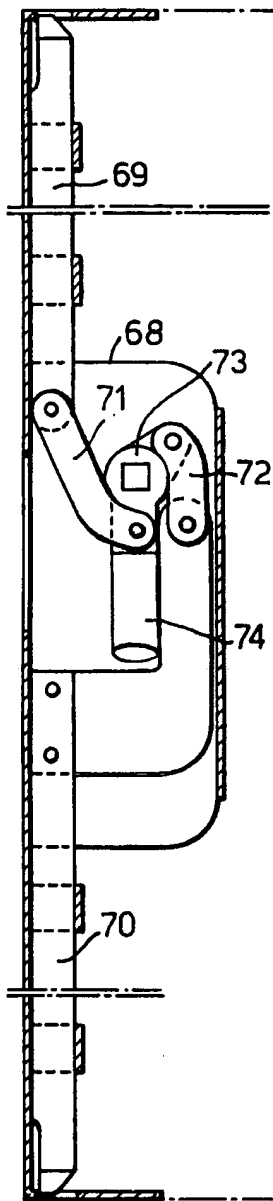


Fig.17.

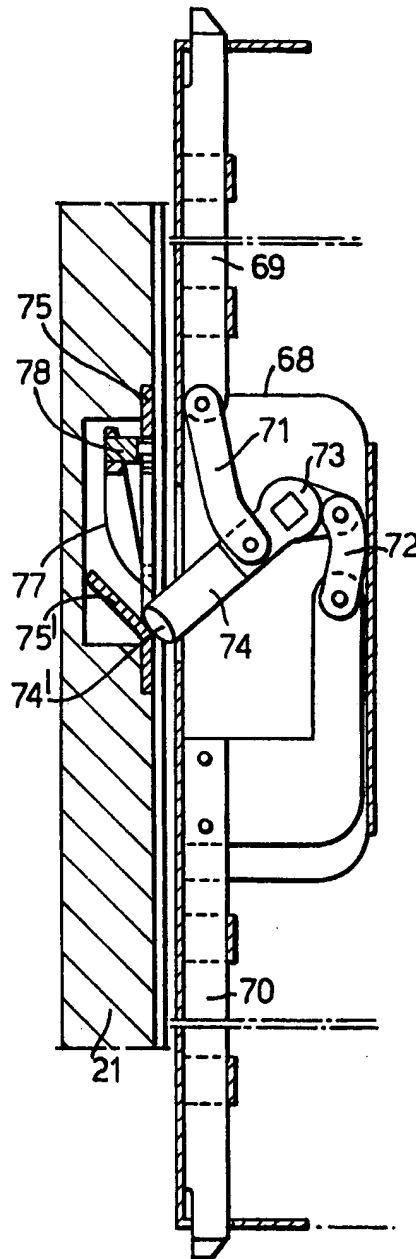
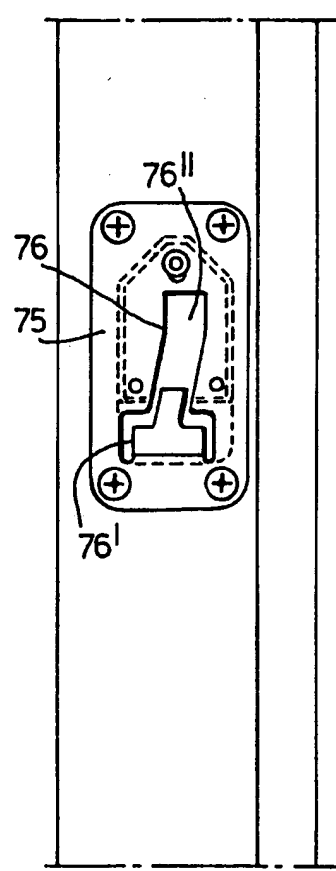


Fig.18.



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Fig.19.

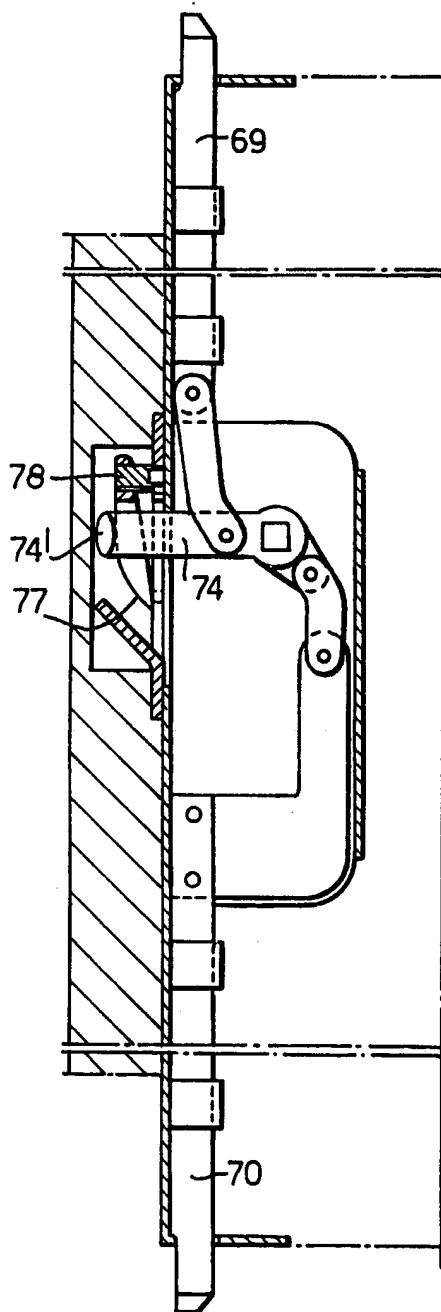
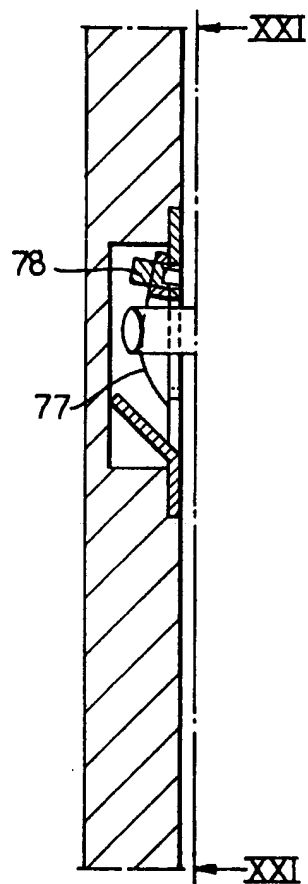


Fig.20.



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Fig.21.

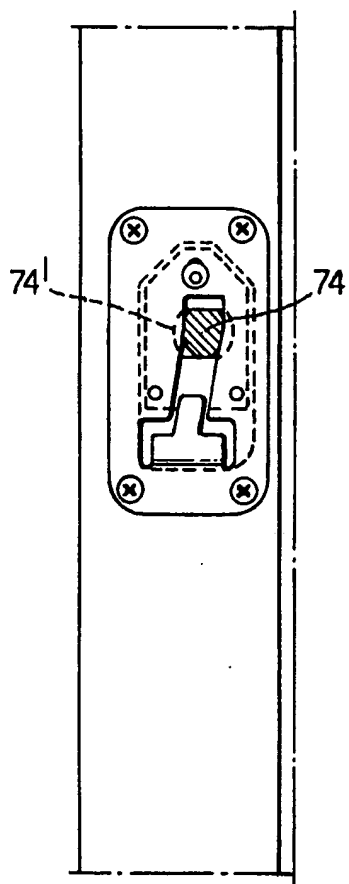
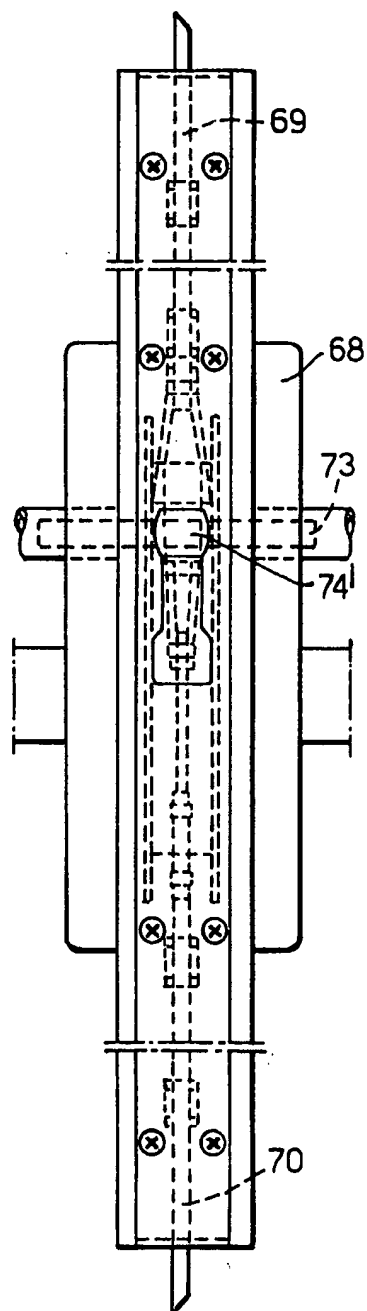


Fig.22.



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Fig.23.

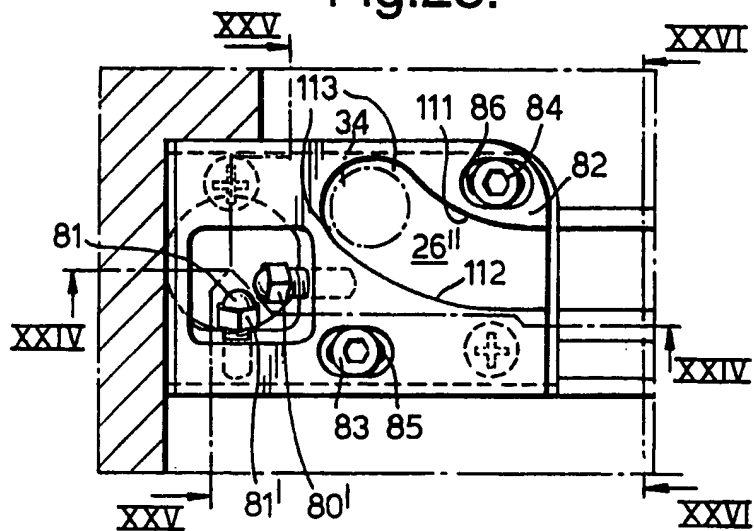


Fig.24.

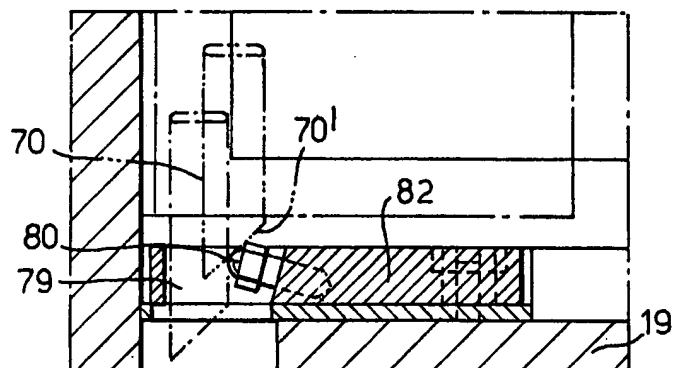


Fig.25.

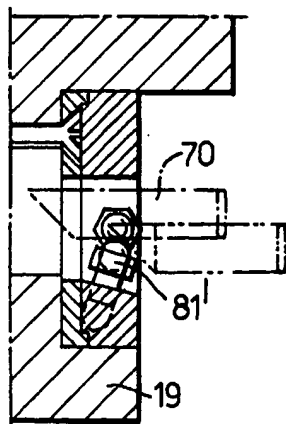
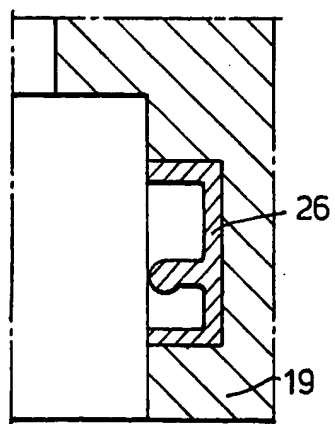
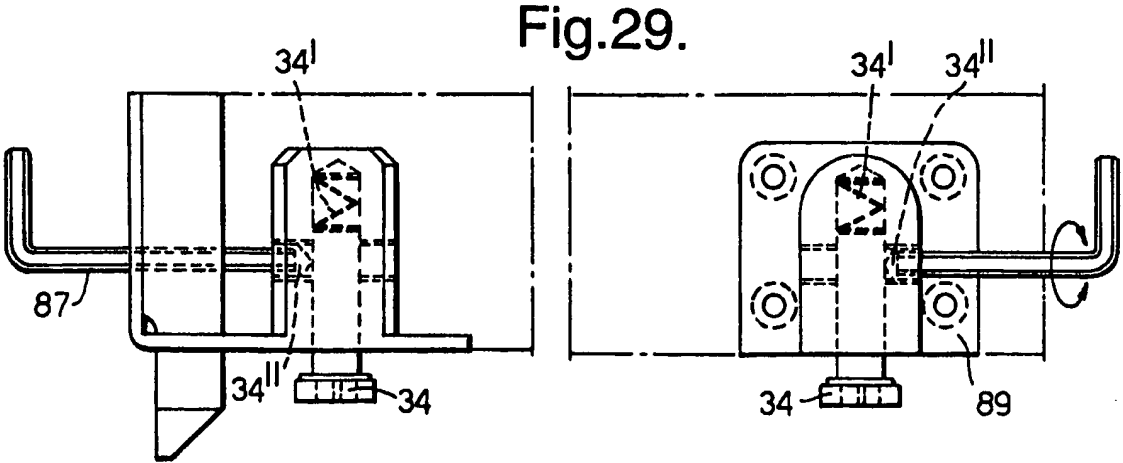
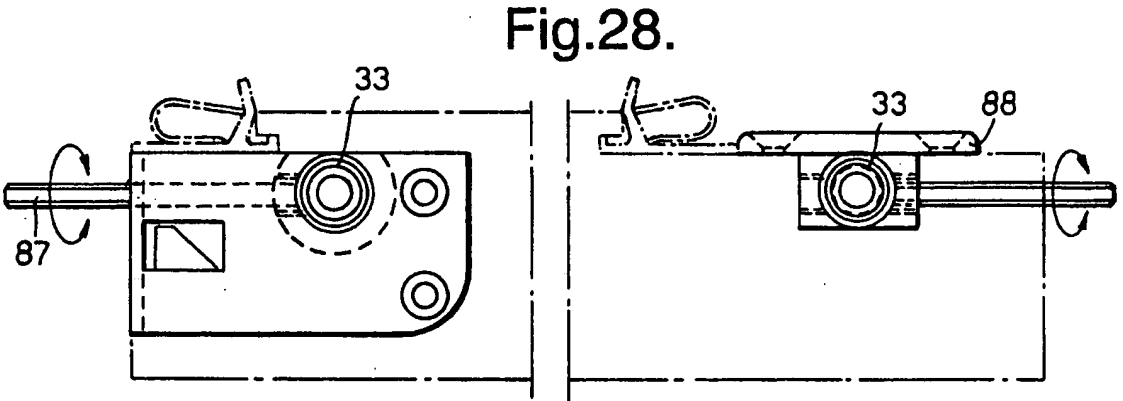
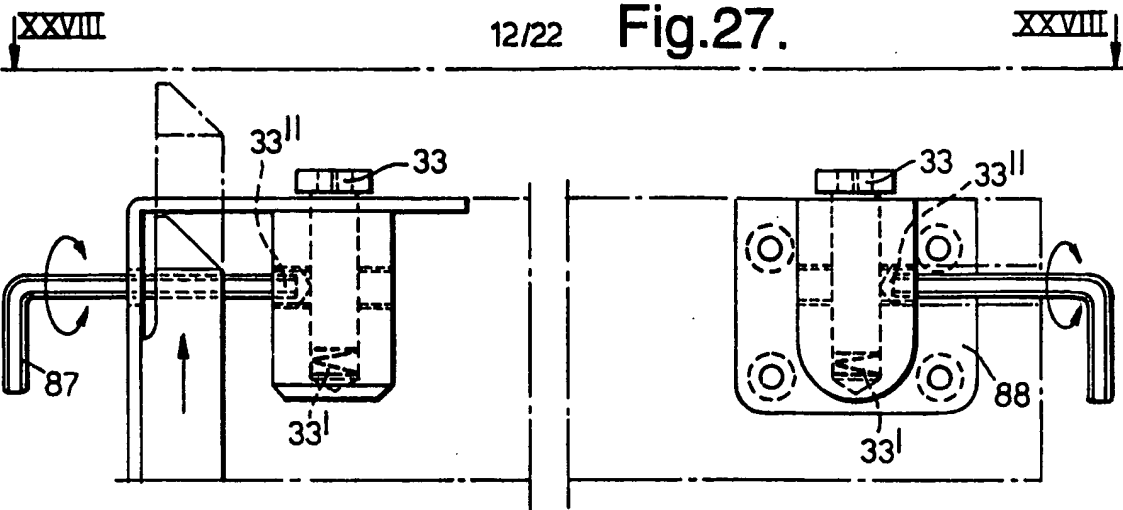


Fig.26.





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Fig.30.

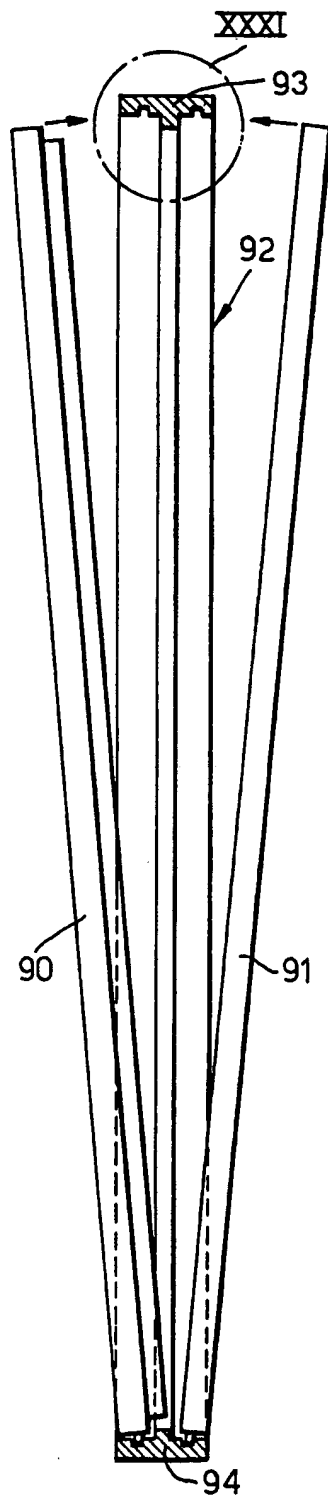
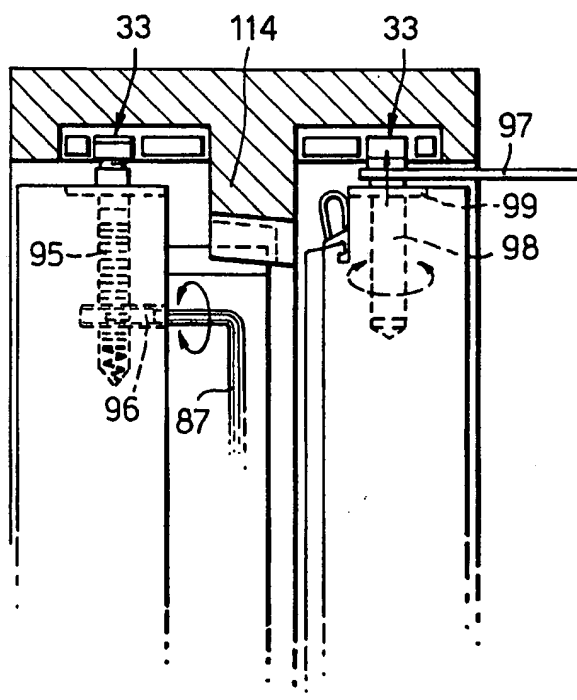


Fig.31.



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Fig.32.

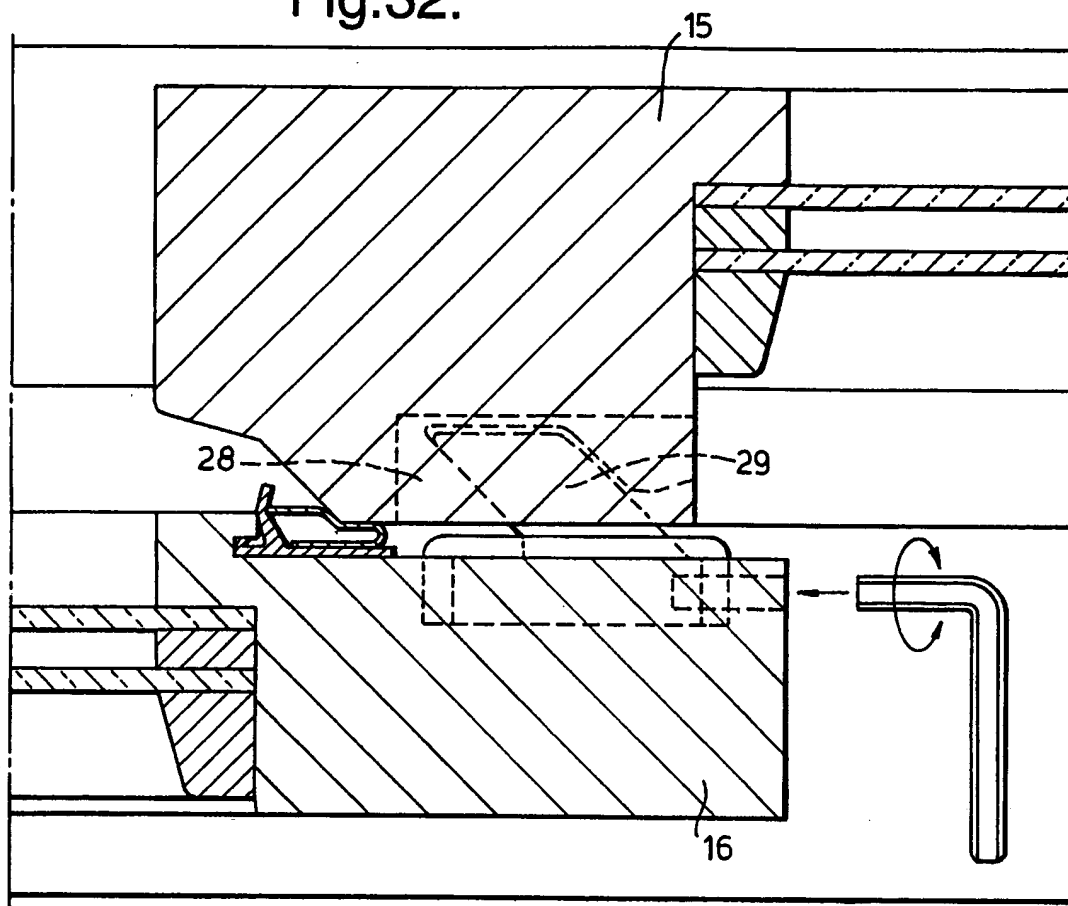
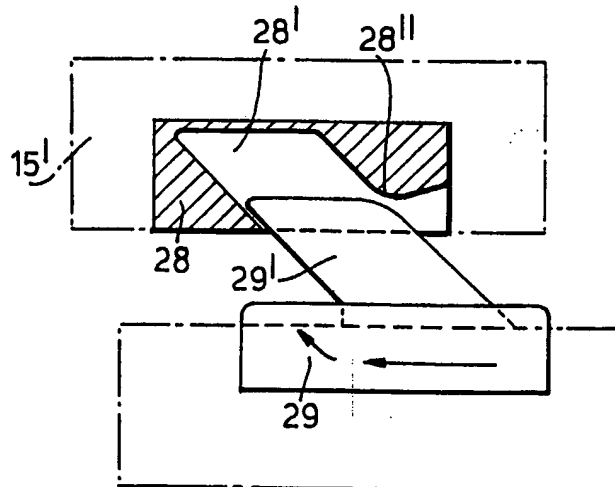


Fig.33.



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Fig.34.

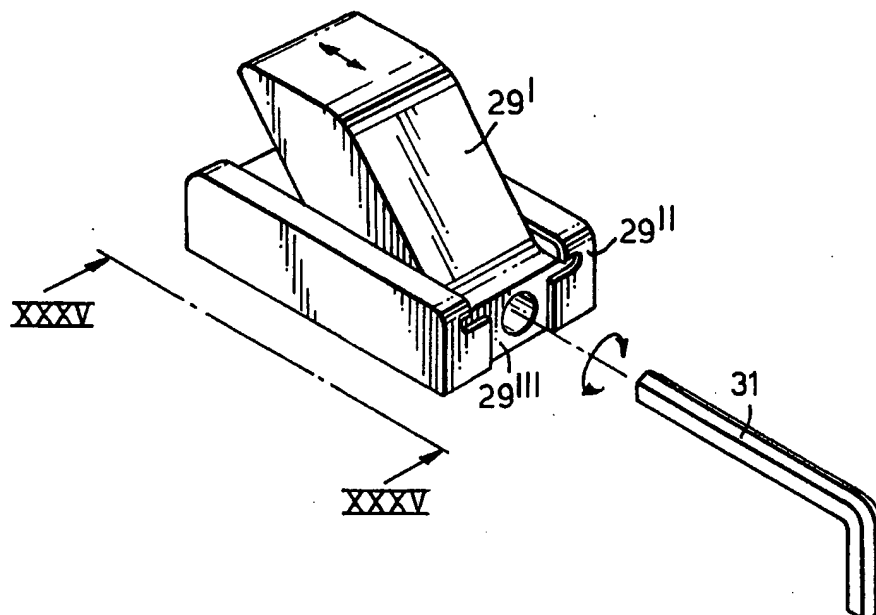
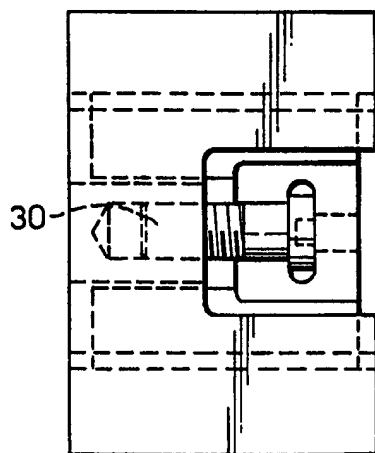


Fig.35.





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Fig.36.

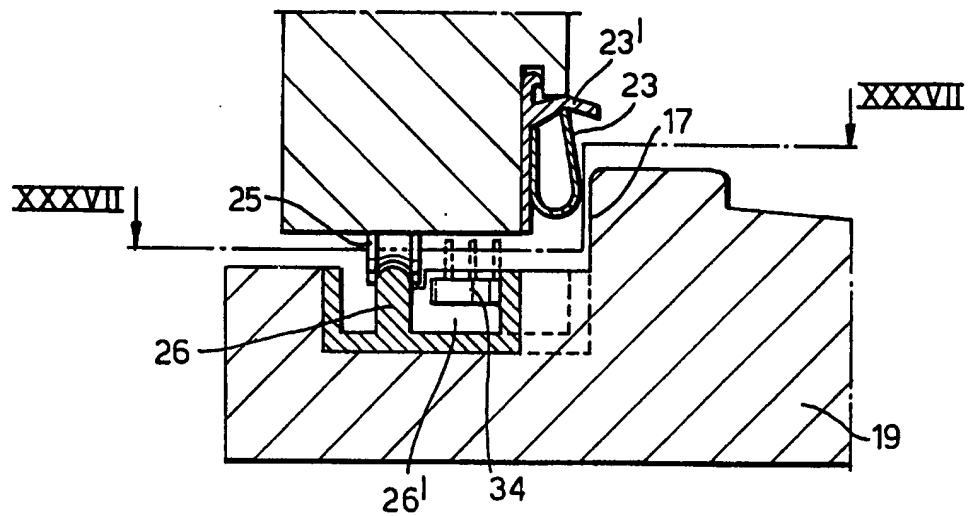
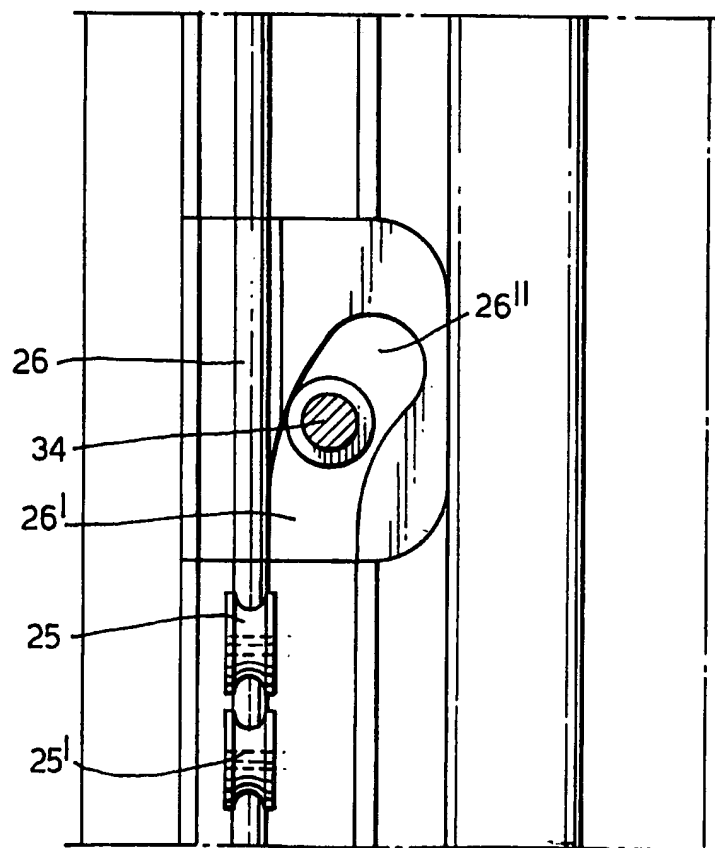


Fig.37.



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Fig.38.

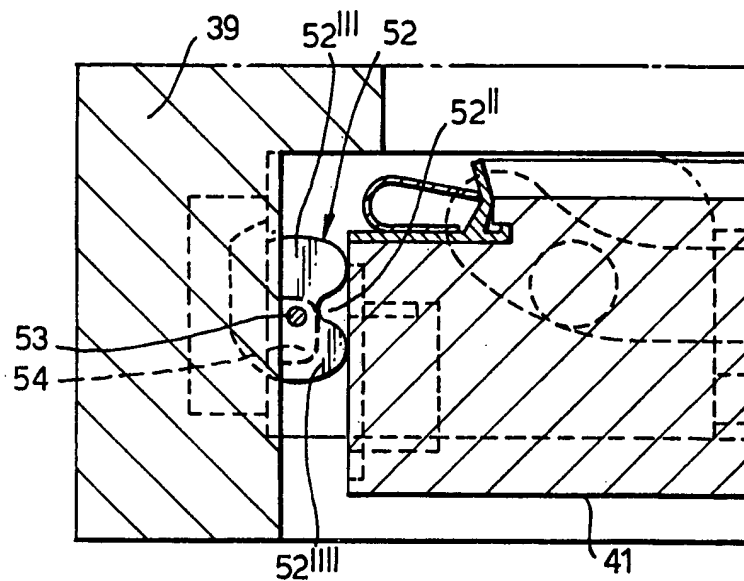
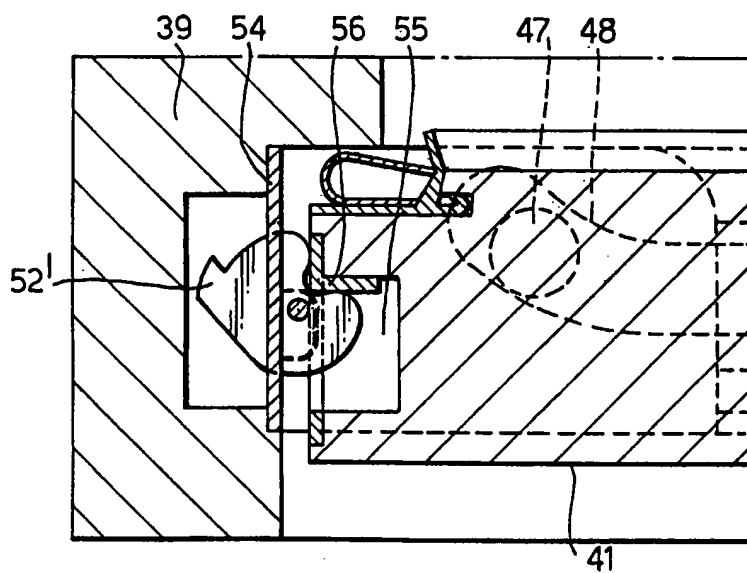


Fig.39.



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Fig.40.

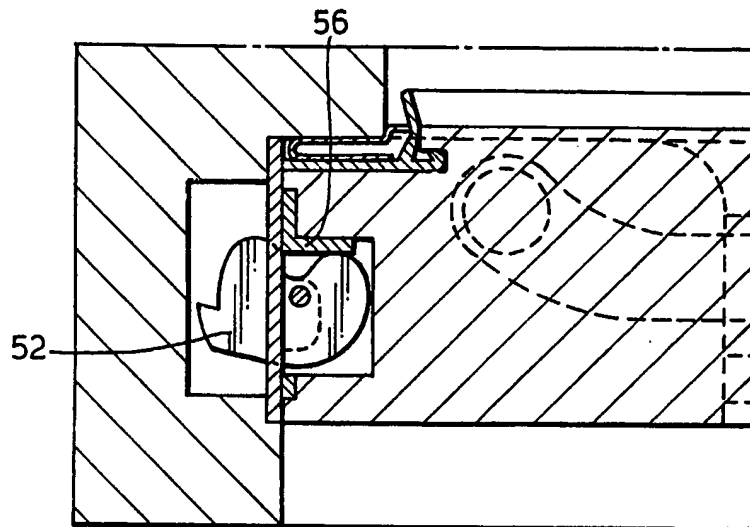
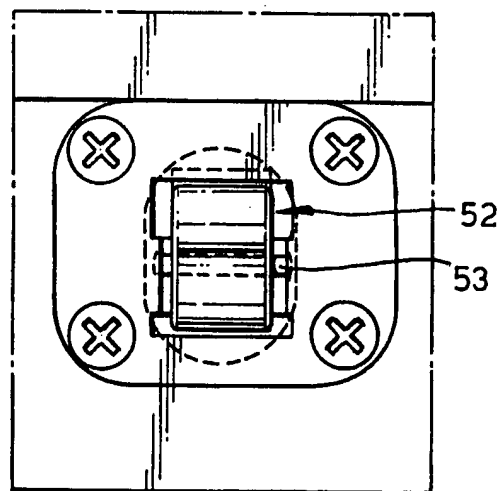
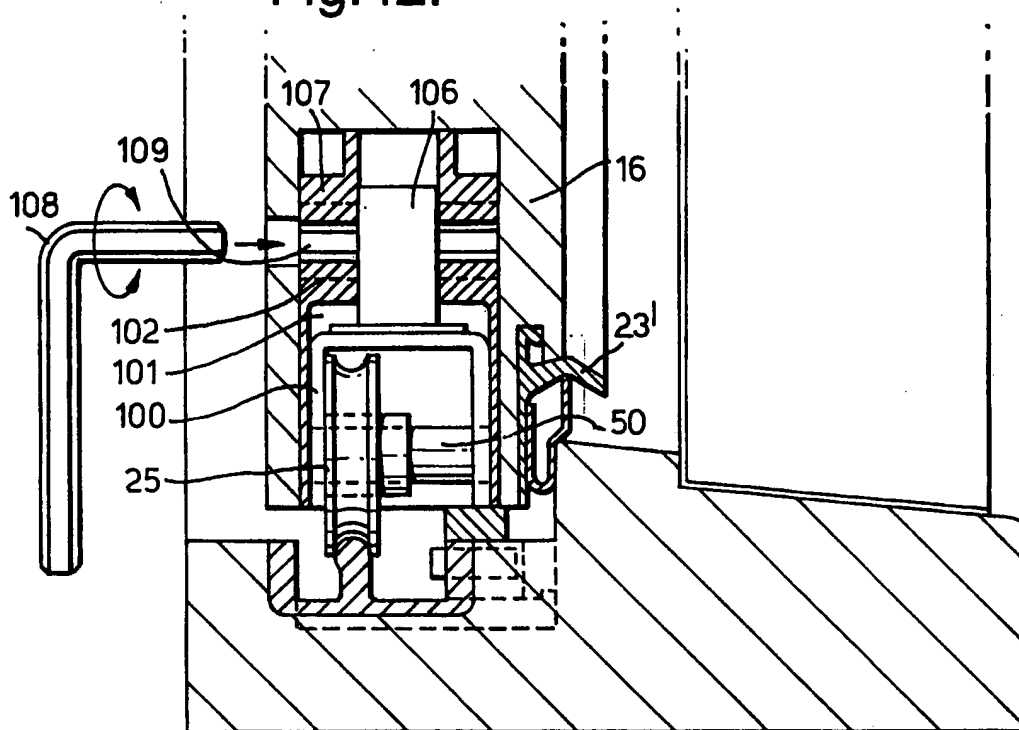


Fig.41.

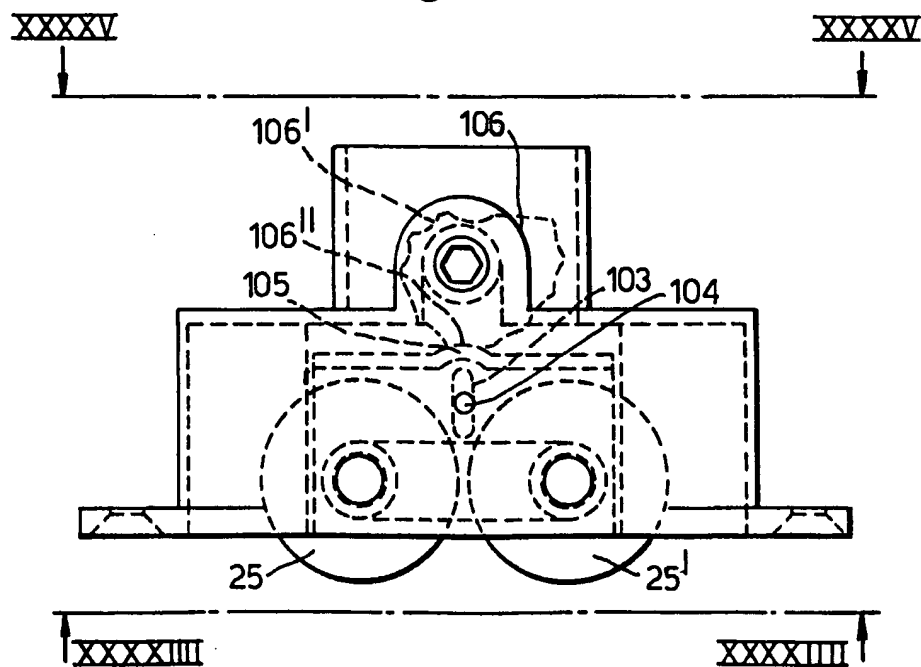


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**Fig.42.**



**Fig.43.**



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Fig.44.

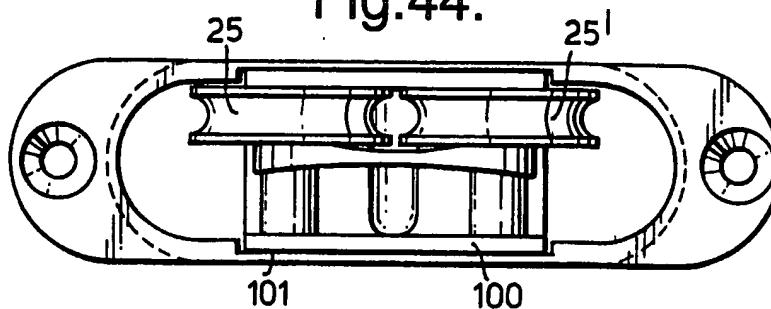


Fig.45.

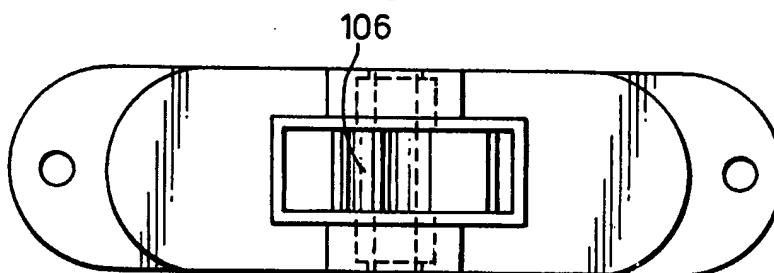


Fig.46.

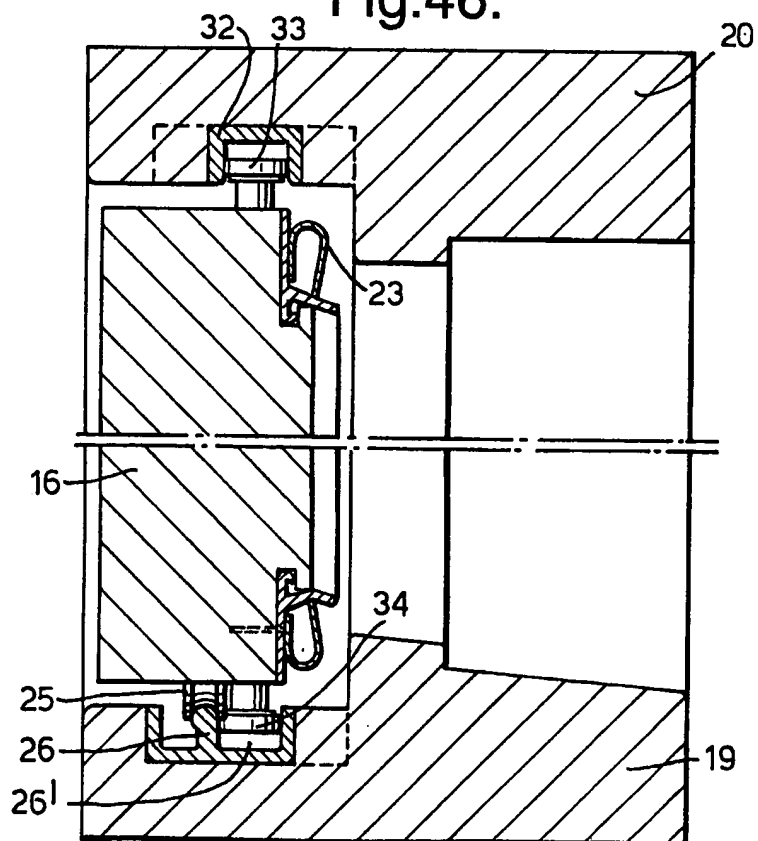


Fig.47.

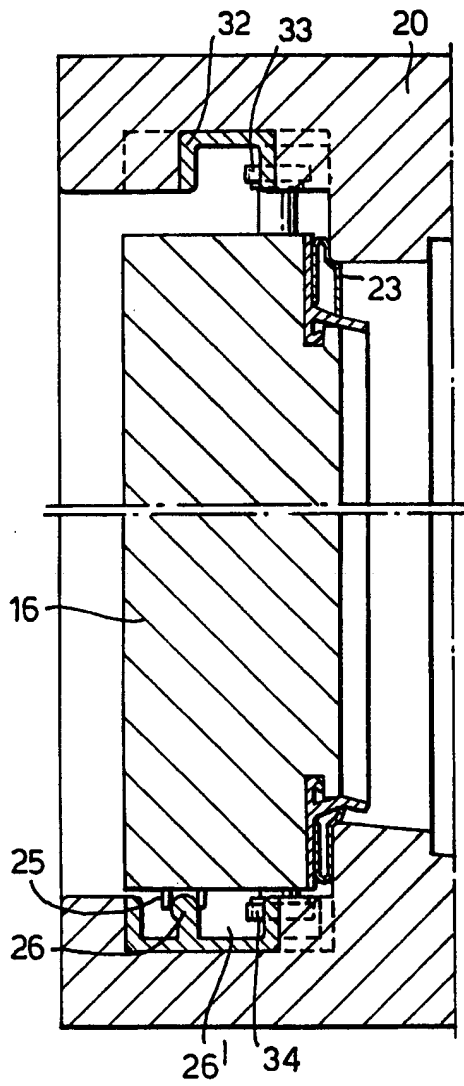


Fig.48.

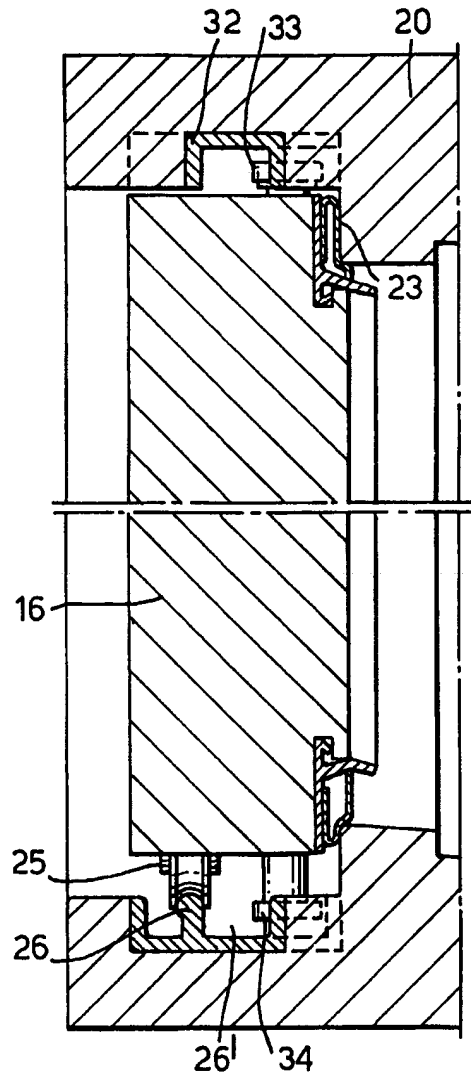
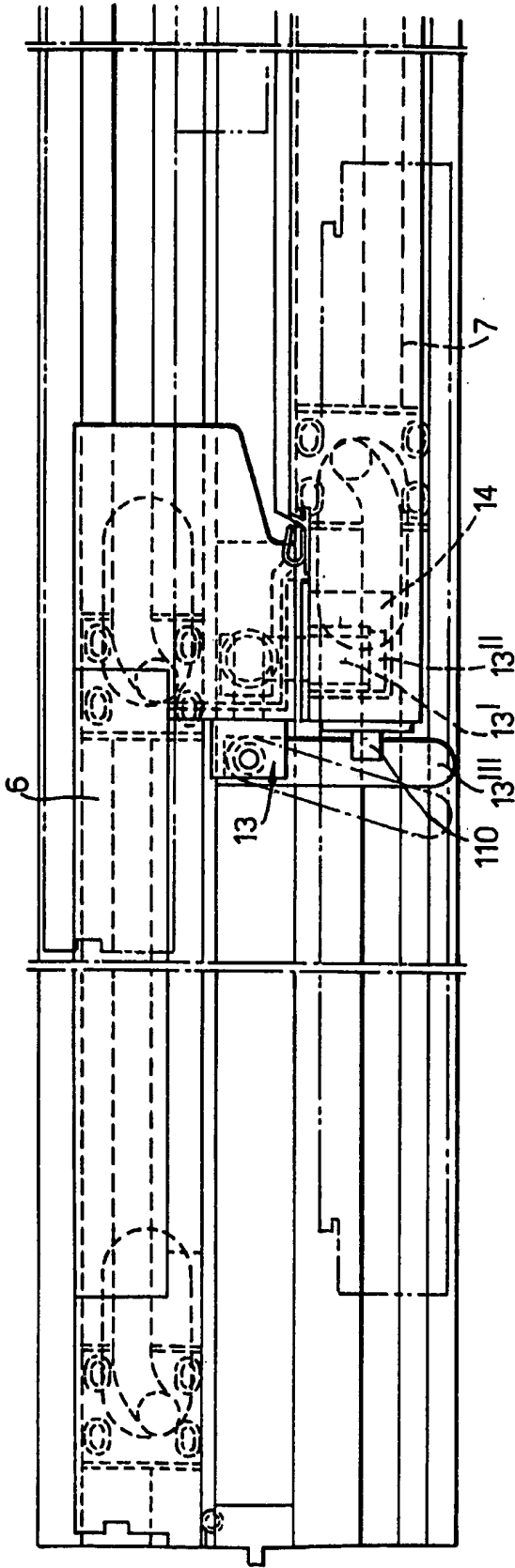


Fig.49.



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 98/00006

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E06B 3/46

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2194578 A (REYTRAC LIMITED), 9 March 1988 (09.03.88)	1
Y	--	2-7,9,11
Y	SE 446207 B (HANDELSBOLAGET UNDER INGENJÖRSFIRMA B SVENSSON), 18 August 1986 (18.08.86)	2-4
Y	NO 104904 C (E.H.B. FORSBERG), 15 August 1964 (15.08.64)	2,5
Y	NO 115927 B (DEVAC., INC.), 30 December 1968 (30.12.68)	6,7,9

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

5 June 1998

Date of mailing of the international search report

09 -06- 1998

Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 98/00006

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 1264314 A (K. ATKINSON), 23 February 1972 (23.02.72) --	11
A	EP 0733766 A2 (HAWA AG), 25 Sept 1996 (25.09.96) --	6,7
A	CH 588007 A5 (ERNST KÜNZLER AG), 31 May 1977 (31.05.77) --	11
A	US 3334375 A (S.E. HUBBARD), 8 August 1967 (08.08.67) --	1-4
A	CH 212371 A (C. GEX), 30 November 1940 (30.11.40) --	1-4
A	GB 2239284 A (FUJISASH CO.), 26 June 1991 (26.06.91) --	1-4
X	DE 2547336 A1 (SOCIMI-SOCIETA COSTRUZIONI INDUSTRIALI MILANO S.P.A.), 18 November 1976 (18.11.76)	13,14,16
Y	--	17
Y	GB 2308404 A (PLUS PLAN (UK) LIMITED), 25 June 1997 (25.06.97) --	17
A	EP 409754 A1 (FERCO INTERNATIONAL), 23 January 1991 (23.01.91) --	13-18
A	GB 2220700 A (HASP INTERNATIONAL LIMITED), 17 January 1990 (17.01.90) --	19-21

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 98/00006

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WD 9625576 A1 (INTERLOCK HARDWARE DEVELOPMENTS LIMITED), 22 August 1996 (22.08.96) --	19-21
A	US 1719203 A (J. TAUSSIG), 2 July 1929 (02.07.29) -- -----	19-21

# INTERNATIONAL SEARCH REPORT

Information on patent family members

29/04/98

International application No.

PCT/NO 98/00006

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
GB	2194578	A	09/03/88	NONE	
SE	446207	B	18/08/86	SE 8201008 A	19/08/83
NO	104904	C	15/08/64	NONE	
NO	115927	B	30/12/68	NONE	
GB	1264314	A	23/02/72	NONE	
EP	0733766	A2	25/09/96	NONE	
CH	588007	A5	31/05/77	NONE	
US	3334375	A	08/08/67	NONE	
CH	212371	A	30/11/40	NONE	
GB	2239284	A	26/06/91	DE 4031517 A,C FR 2656364 A,B JP 3194086 A US 5189837 A	04/07/91 28/06/91 23/08/91 02/03/93
DE	2547336	A1	18/11/76	AR 209132 A AU 8702375 A BE 836853 A BR 7508464 A CA 1047066 A CH 603376 A DD 123512 A DK 575375 A EG 12441 A FI 753561 A FR 2310236 A,B GB 1513686 A IN 155529 A JP 51085111 A NL 7513906 A SE 7514182 A AT 345335 B BG 37073 A CA 1033989 A DE 2522640 A DE 2545694 A,C FR 2294871 A,B FR 2310235 A,B GB 1485921 A GB 1498455 A US 3994094 A ZA 7507324 A	31/03/77 02/06/77 16/04/76 24/08/76 23/01/79 15/08/78 05/01/77 21/06/76 31/03/79 21/06/76 03/12/76 07/06/78 16/02/85 26/07/76 22/06/76 21/06/76 11/09/78 15/03/85 04/07/78 01/07/76 18/11/76 16/07/76 03/12/76 14/09/77 18/01/78 30/11/76 24/11/76
GB	2308404	A	25/06/97	GB 9526268 D	00/00/00
EP	409754	A1	23/01/91	NONE	
GB	2220700	A	17/01/90	NONE	

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

29/04/98

International application No.

PCT/NO 98/00006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9625576 A1	22/08/96	AU 4680196 A GB 9717312 D	04/09/96 00/00/00
US 1719203 A	02/07/29	NONE	